Nov.

BROADCAST WRNY STATION

25 Cents

Science and Invention

IS THIS POSSIBLE

See Page 590

EXPERIMENTER PUBLISHING COMPANY, NEW YORK, PUBLISHERS OF
RADIO NEWS - RADIO LISTENERS' GUIDE - SPARE-TIME MONEY MAKING - FRENCH HUMOR - AMAZING STORIES

30 DAYS FREE TRIAL

Battery or
All-Electric
OPERATION

HERE is the great value offer of the day. Test and try this powerful seven-tube RANDOLPH RADIO for thirty days. After it **brings in stations from coast to coast** with amazing clearness—**with easy one-dial tuning**—after it **easily equals any other radio** regardless of cost—after you are more than satisfied then you can buy it **direct at factory prices. Every RANDOLPH must make good before it is sold.**

The RANDOLPH SEVEN-TUBE CONSOLE illustrated here can be had for use with batteries or **connected direct to the electric light socket—absolutely batteryless—no batteries, chargers or acids—just plug in and tune in.** 100% efficient either way. Its construction and performance have been tested and approved by leading radio engineers and authorities—by leading radio publications and laboratories.

7 Tubes—Single Control
Illuminated Drum

One drum dial operated by one simple vernier control tunes in all stations with easy selectivity to tremendous volume. No overlapping of stations. Illuminated drum permits operation in the dark. Volume control for finer volume modulation. This is a seven-tube tuned radio frequency receiver with power transformers and power amplification. Space wound solenoid coils. Full and completely shielded. A real receiver of the highest quality. Tremendous distance, wonderful tone quality, simple to operate.

Beautiful Walnut Console
Built-in Cone Speaker

The Randolph Seven-tube Ampliphonic Console illustrated above is housed in a genuine burl-walnut cabinet with two-tone hand rubbed finish giving it unsurpassed beauty. The same expert cabinet work has gone into the making of these consoles as in the finest furniture. Has **built-in cone loud speaker that compares with any on the market.** Accurately reproduces complete range of musical notes from the highest to the lowest pitch.

What Users Say

I have logged more than 50 stations from coast to coast.—Lloyd Davenport, Littlefield, Texas. I have logged 52 stations from Cuba to Seattle, the set is a world beater.—J. Tampkinson, Detroit, Mich. Your set is a revelation, has all others tied to the post for distance and selectivity.—Waldo Powers, Vergennes, Vermont. On strength of its performance sold two more sets this week.—T. Scanlow, Orlando, Florida.

The Randolph 7-Tube Console Single Control RETAIL PRICE Completely Assembled $99

The Senior Six

Now you can have a new, modern, single-control, six-tube radio. Do not compare this set with old style 2-dial 6-tube sets selling for about the same price. The Randolph 1928 Senior Six has also been tested and approved by the leading radio engineers.

Comes in a beautiful solid walnut cabinet of hand-rubbed finish. Single control. Illuminated Drum with space for logging. Absolutely dependable and very selective. **Sent for 30 Days' Free Trial. You test it before you buy.**

6-Tube $55 Retail Price Single Control

MAIL COUPON NOW!

The Randolph Radio Corporation are pioneers in the manufacture of radios. All of its vast and unlimited resources have been used in making and perfecting of the Randolph Receivers. Because of our long and successful experience in the radio business, we are perfectly confident in sending out a Randolph Radio on trial. We know what it will do. Mail us the coupon now for the greatest radio offer ever made.

Sensationally Big Discounts to Agents

Work either full or part time and make big money. Tremendous advertising campaign helps you sell. Regardless of whether you have ever sold before, be sure to get our proposition. The Randolph sells on first demonstration. Men and women both can make money this easy way. Get your demonstration set for thirty day's **FREE TRIAL.**

RANDOLPH RADIO CORPORATION
711 West Lake Street Dept. 239, Chicago, Illinois

Use This Coupon NOW!

Randolph Radio Corporation,
711 West Lake Street, Dept. 239
Chicago, Illinois.

Send me full particulars about the RANDOLPH Six and Seven-Tube All-Electric and Battery Table and Console Sets with details of your **30 Day FREE Trial Offer.**

Name.....

Address.....

City..... State.....

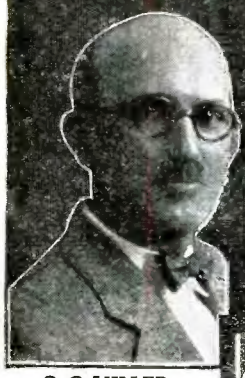
Mark here ☐ if interested in Agent's proposition.

www.americanradiohistory.com

A Twin Service for Ambitious Men

T — Training — Preparing you for a better job and a Raise in Pay

E — Employment — Placing you in a good, well-paid Position



O. C. MILLER
Director Extension Work

A Million Dollar Institution Back of This GUARANTEE

Get this straight—the American School was chartered in 1897 as an *educational* institution, *not for profit.* So you will find the same standards of service here as in the best resident schools and colleges. Over 200 of the leading Engineers, Executives and Educators of the U. S. prepared the instruction we offer. Their standing vouches for its *quality.* This is available to you on terms of only a few dollars a month. *Write for our souvenir book, "White Magic,"* given FREE in celebration of our 30th Anniversary.

Free Job Service

The American School is the first in the home-study field to recognize the need of guaranteeing its courses with a money-back contract, if the training fails to accomplish the benefits you expect. Thus all risk and doubt are eliminated—either the training will help you to a better job and a raise in pay or it will cost you nothing. To better carry out this important service, we maintain a National employment department which keeps in touch with the employers of Draftsmen all over the U. S. All this without extra charge to our students and graduates.

IF You Are Now Earning $40 a Week or Less—

I guarantee to *prepare* you for a fine Drafting position, right in your home, in your spare time; then I guarantee to help you find such a position paying at least 50% *more than you earn today,* within 60 days after you complete this training, or I will refund the small amount you pay for tuition. We make this agreement to prove this instruction *will* make you a *real Draftsman.* Back of this guarantee are the entire resources and reputation of this million dollar institution.

O. C. Miller

Go into Drafting!

Learn Drafting—how to *make* and *read* plans, and the doors of opportunity in all mechanical, building, and engineering lines swing open for you! There are more well-paid Drafting jobs open today than in any other one profession or trade. There's a variety, a fascination to Drafting that will grip you. No other work is so interesting, *so well paid*—no other field offers equal opportunities for quick promotion.

The Draftsman is the Boss of the Works!

Destroy blue-prints and *plans,* and the wheels of all Industry will stop until new ones can be made. Every move of every workman on the job is *controlled* by the Draftsman through his plans. Railroads, public works, buildings of a hundred sorts, machinery, electricity, automobiles—all manufacturing and construction *start* on the Drafting table! That's the kind of work to get into, friend. Where you have the same chance as anybody else to make a *quick success!*

3 Drafting Lessons Actually FREE

—to prove you can learn at home in spare time!

You'll be surprised how *quickly* you can learn Drafting by our new one-step-at-a-time method. We start you off doing actual Drafting room jobs from the very beginning. Before you know it, you are batting out professional plans like a veteran. Get the first three lessons—the coupon brings them. *Do them.* Test your ability to master Drafting at home. Without cost or obligation.

Professional Outfit GIVEN!

You will naturally expect the American School to give you the best kind of instruments and tools with the best kind of training. This outfit is good enough to use professionally after you finish your training. Mail coupon for description.

O. C. Miller, *Director Extension Work*

O. C. Miller, Director Extension Work
American School, Dept D-826
Drexel Ave. and 58th St., Chicago

Your offer to send me 3 lessons free and facts about the opportunities in Drafting and about your course, looks good to me. It is understood I am not obligated in any way in making this request.

Name .....

Address .....

Occupation ..... *Age* .....

The American School

Dept. D-826, Drexel Avenue and 58th Street, Chicago

www.americanradiohistory.com

Science and Invention

Vol. XV
Whole No. 175

November
1927
No. 7

Formerly ELECTRICAL EXPERIMENTER
COMBINED WITH "THE EXPERIMENTER"
Member Audit Bureau of Circulations

EDITORIAL, ADVERTISING & GENERAL OFFICES:

230 Fifth Avenue, New York City

Published by Experimenter Publishing Company, Inc. (H. Gernsback, Pres.; S. Gernsback, Secy. and Treas.)
Publishers of SCIENCE & INVENTION, RADIO NEWS, RADIO LISTENERS' GUIDE, AMAZING STORIES, SPARE-TIME MONEY MAKING and FRENCH HUMOR.

Editorial Staff

HUGO GERNSBACK, *Editor-in-Chief.*
H. WINFIELD SECOR, *Managing Editor.*
T. O'CONOR SLOANE, PH. D.
Associate Editor
JOSEPH H. KRAUS, *Field Editor.*
PAUL WELKER, *Radio Editor.*
S. GERNSBACK, *Wrinkles Editor.*
W. J. ROMAINE, *Art Director.*

Contributing Editors

Astronomy—
Dr. [illegible] Menzel, Ph.D., Lick Observatory; W. J. [illegible], the Harvard College Observatory.
Entomology and Allied Subjects—
Dr. Ernest Bade, Ph.D.
Physics—
Dr. Harold F. Richards, Ph.D., Ernest K. Chapin, M.A., Dr. Donald H. Menzel, Ph.D.
Chemistry—
Raymond B. Wailes, Dr. Ernest Bade, Ph.D.
Automotive Subjects—George A. Luers
Radio—A. P. Peck, Herbert Hayden.
Magic and Psychic Phenomena—
Joseph Dunninger, Joseph F. Rinn, Edward Merlin.
Foreign Correspondents—
Dr. Alfred Gradenwitz, Germany; Dr. H. Becher, Germany; C. A. Oldroyd, England; S. Leonard Bastin, England; Count A. N. Mirzaoff, France; Hubert Slouka, Czecho-Slovakia; P. C. van Petegem, Holland; Richard Neumann, Austria.

IN DECEMBER ISSUE

Growing Plants in Sealed Containers

A very interesting article, particularly at this season of the year, which will interest both young and old.

Ore Located by Vibration

The well-known earthquake detector, known as the seismograph, plays a new rôle in applied science.

If We Had No Ears, Would There Be Any Sound?

A scientific discussion of this and similar questions which have been argued from pole to pole.

Third Dimension Movie Screen

Newly perfected motion picture screen which causes images to appear in relief.

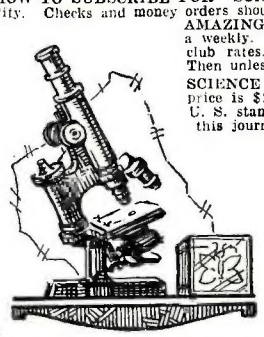
CONTENTS OF THIS NUMBER

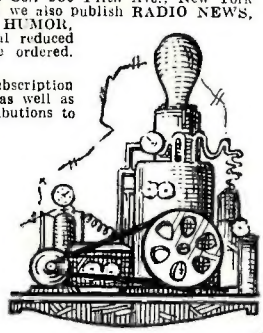
Editorial ..... *By Hugo Gernsback*	589
Is This Possible? ..... *By Joseph H. Kraus*	590
Sound Compass Conquers Fog ..... *By H. H. Dunn*	591
The Modern Shell Game ..... *By Beryl Dill Kneen*	592
Science in the Camera's Eye	593
The Metal Emperor ..... *By A. Merritt*	594
$3,000.00 Wirekraft Contest	596
A Yardstick of the Sky	598
Lily Pad Supports Person	599
The Astrology Humbug	599
Model Cup Winner For This Month ..	600
Building a Model of the U. S. Brig of War "Truxton" ..... *By William A. Crosby, Part 4.*	601
New Single Sleeve Auto Engine	603
With the Science Reporter	604
Peyote—Mystic Fruit of Mexico ..... *By Count A. N. Mirzaoff*	605
The Rôle of Wavelength in Theories of Radiation ..... *By F. K. Richtmyer, Prof. of Physics, Cornell University.*	607
Fire Engine Raises Water 1200 Feet...	608
Newest Musical Progress.....	609
Electricity Speeds Up Crops.....	610
Magic—A Monthly Feature..... *By Dunninger*	611
Motor Hints—Conducted by George A. Luers	612
Home Mechanics—How to Make a Sewing "Carry All" ..... *By H. L. Weatherby*	613
Experimental Chemistry—Tarnish and Rust Prevention ..... *By Dr. Ernest Bade*	614
Experimental Electrics—A Magnetic Balance Ammeter ..... *By William Capune*	615
Constructor Department	616
Hints For the Mechanic.....	617
How-to-Make-It Department	618
Readers Forum	619
Wrinkles, Recipes and Formulas..... *Edited by S. Gernsback*	620
Radio "Hand" Helps Planes to Land..	621
Radio "Guard" Watches Water Supply.. *By Walter E. Burton*	622
Pacific Fliers Led By Radio Beacon....	623
Making a Loop-Speaker..... *By Herbert C. McKay*	624
Radio Oracle	625
Scientific Humor	626
Latest Patents	627
Oracle	628
Patent Litigation ..... *Discussed by John Flam, Patent Attorney*	636
A Perpetual Motion Hoax—(Conclusion).	657

HOW TO SUBSCRIBE FOR "SCIENCE AND INVENTION." Send your name, address and remittance to Experimenter Publishing Co., 230 Fifth Ave., New York City. Checks and money orders should be made payable to Experimenter Publishing Co., Inc. Mention magazine desired, inasmuch as we also publish RADIO NEWS, AMAZING STORIES, RADIO LISTENERS' GUIDE, SPARE-TIME MONEY MAKING and FRENCH HUMOR, a weekly. Subscriptions may be made in combination with the other publications just mentioned at special reduced club rates. Send postal for club rate card. Subscriptions start with the current issue unless otherwise ordered. Then unless we receive your order and remittance of a renewal, delivery of the magazine is stopped.

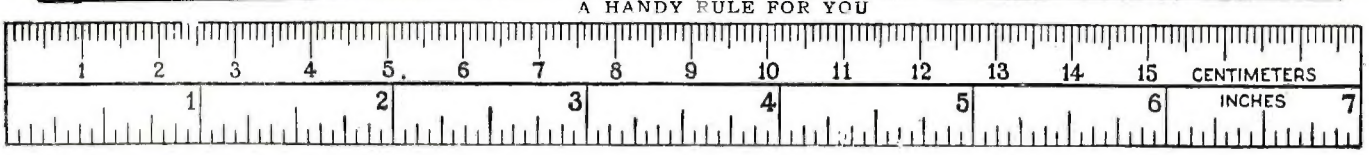
SCIENCE AND INVENTION is published on the 10th of each month. There are 12 numbers per year. Subscription price is $2.50 a year in U. S. and possessions. Canada and foreign countries $3.00 a year. U. S. Coin as well as U. S. stamps accepted (no foreign coin or stamps). Single copies 25c each. All communications and contributions to this journal should be addressed to Editor, SCIENCE AND INVENTION, 230 Fifth Avenue, New York City, N. Y. Unaccepted contributions cannot be returned unless full postage has been included. ALL accepted contributions are paid for on publication. SCIENCE AND INVENTION Monthly. Entered as second class matter May 10, 1924, at the Post Office at New York, N. Y., under the act of March 3, 1879. Additional entry at Dunellen, N. J. Title Registered at the Patent Office. Copyright, 1927, by E. I. Co., Inc., New York. The Contents of this Magazine are copyrighted and must not be reproduced without giving full credit to the publication. SCIENCE AND INVENTION is for sale at all newsstands in the United States and Canada. European Agents, S. J. Wise Et Cie, 40, Place Verte, Antwerp, Belgium.

ADVERTISING REPRESENTATIVES—L. F. McCLURE, 720 Cass St., Chicago, Ill.; DAVIES, DILLON & KELLY, 15 West 10th St., Kansas City, Mo.; T. F. MAGRANE, Park Square Bldg., Boston, Mass.; HARRY E. HYDE, 548 Drexel Bldg., Philadelphia, Pa.; A. J. NORRIS HILL CO., 5 Third St., San Francisco, Calif., 412 West 6th St., Los Angeles, Calif.; Leary Bldg., Seattle, Wash.



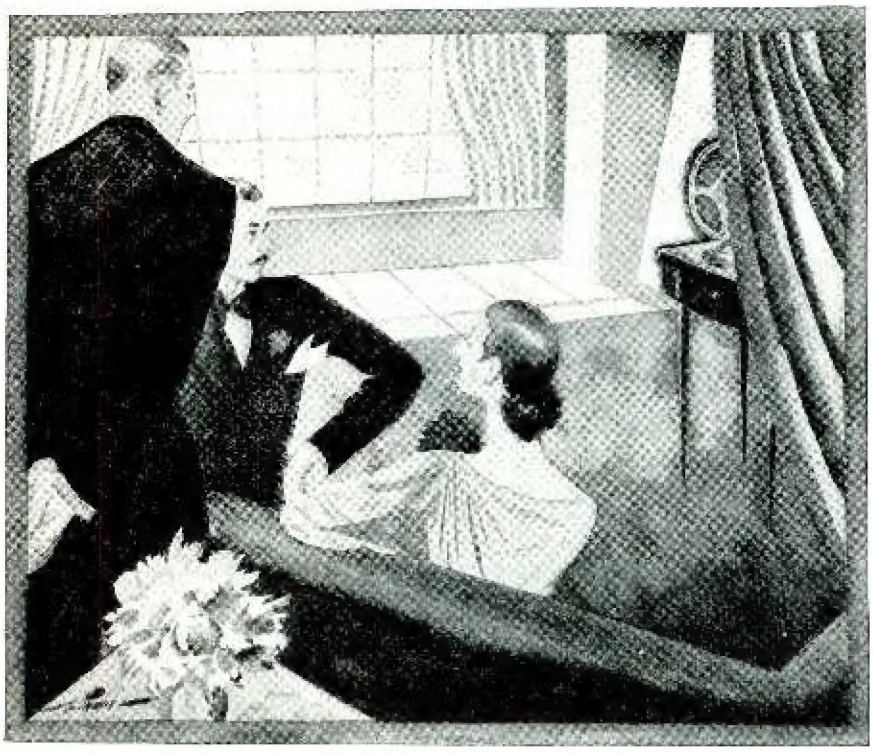


A HANDY RULE FOR YOU



www.americanradiohistory.com

... Modern



Here is the Eveready Layerbilt "B" Battery No. 486, Eveready's longest-lasting provider of Battery Power.

Radio is better with *Battery* Power

NOT because they are new in themselves, but because they make possible modern perfection of radio reception, batteries are the modern source of radio power.

Today's radio sets were produced not merely to make something new, but to give you new enjoyment. That they will do. New pleasures await you; more especially if you use Battery Power. Never were receivers so sensitive, loud-speakers so faithful; never has the need been so imperative for pure DC, Direct Current, that batteries provide. You must operate your set with current that is smooth, uniform, steady. Only such current is noiseless, free from disturbing sounds and false tonal effects. And only from batteries can such current be had.

So batteries are needful if you would bring to your home the best that radio has to offer. Choose the Eveready Layerbilt "B" Battery No. 486, modern in construction, developed exclusively by Eveready to bring new life and vigor to an old principle—actually the best and longest-lasting Eveready Battery ever built. It gives you Battery Power for such a long time that you will find the cost and effort of infrequent replacement small indeed beside the modern perfection of reception that Battery Power makes possible.

NATIONAL CARBON CO., INC.
New York [UCC] San Francisco
Unit of Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night —9 P. M., Eastern Standard Time

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
WCCO—*Minneapolis, St. Paul*
KSD—*St. Louis*
WDAF—*Kansas City*
WRC—*Washington*
WGY—*Schenectady*
WHAS—*Louisville*
WSB—*Atlanta*
WSM—*Nashville*
WMC—*Memphis*

Pacific Coast Stations— 9 P. M., Pacific Standard Time

KPO—KGO—*San Francisco*
KFOA—KOMO—*Seattle*
KFI—*Los Angeles*
KGW—*Portland*

EVEREADY
Radio Batteries
—they last longer

The air is full of things you shouldn't miss

www.americanradiohistory.com

INDEX TO ADVERTISERS

	Page
A	
Algonquin Electric Company	670
Amalgamated Sales & Service Co.	656
American Auto Painting School	656
American Auto & Radio Mfg. Co. 644, 648, 650, 656, 660,	667
American Chime Clock Co.	671
American School, The 577,	668
American School of Aviation	641
American School of Music	667
American School of Photography	656
American Society for Promotion of Aviation, The	677
American Telephone & Telegraph Co.	653
Andrews, Frank	670
Anita Company	676
Audel & Co., Theo. Inside Back Cover	
Automatic Rubber Co.	650
Aviation Institute of U. S. A.	587
B	
Balda Art Service	665
Bathe Manufacturing Co.	677
Bell Perfume Company	661
Bernard & Heller	638
Bliss Electrical School	646
Boeing, M. L.	665
Bogue, B. N.	677
Buescher Band Instrument Co.	646
Bureau of Inventive Science	638
Bush, David V.	645
C	
Cervenec System, A	669
Chemical Institute of N. Y., Inc.	582
Chicago Correspondence School of Music, Inc.	660
Chicago Painting School	660
Coleman, Watson E.	638
Conn, Ltd., C. G.	659
Consrad Co., Inc. 584, 640, 662, 666, 672,	673
Cooke School of Electricity, L. L.	635
Cox, S. J.	676
Coyne Electrical Schools	581
Cushing, H. C., Jr.	650
D	
Dobe Easy Drafting	667
Douglas, Lyle	676
Dryer, Prof. J. A.	677
E	
Educator Press	646
Electro Magnetic Tool Co.	650
Engineers' Service Co.	677
Evans & Co., Victor J.	639
F	
Fawcett Publications, Inc.	631
Federal Mail Order Corp.	646
Ferry & Co.	660
First Hawaiian Conservatory of Music	670
Fisher Mfg. Co., Adam	638
Franklin Institute 653,	670
G	
Gerold Co., The	644
Gilson Slide Rule Co.	676
Givens, E. S.	669
Gordon Candy Co.	653
H	
Hardin-Lavin Co.	657
Hobart Brothers Co. 650,	659
Holton, Co., Frank	668
I	
Ideal Aeroplane & Supply Co.	671
Inkograph Company, The	588
International Correspondence Schools 648, 660, 663,	664
International Typewriter Exchange	671
Inventors Service Bureau	638
Irwin Aircraft Co.	667
K	
Kelsey Co., The	677
Kennedy, Ralph M	646
L	
Laboratory Materials Company	676
Lacey & Lacey	636
Lancaster & Allwine	638
LaSalle Extension University	676
Leonard, A. O.	648
Le Page's Craft League	643
Liberty Candy & Supply Co.	646
Liederman, Earle E.	642
Liggett & Myers Tobacco Co.	663
Loftis Brothers & Co.	670
Mc	
McCarrie School of Mechanical Dentistry	656
McGraw-Hill Book Co., Inc. 647,	674
M	
MacMahon, Charles	669
Marwood Radio Corp.	657
Maxson, F. P.	660
Meccano Co., Inc.	667
Metal Arts Co., The	660
Metal Cast Products Co.	677
Metro Electric Co. 629, Back Cover	
Midwest Radio Corp'n	661
Miller, Monroe E.	638
Milo Publishing Co.	632
Miniature Ship Models, Inc.	586
Motion Picture Publications, Inc.	680
Movie Operators School	667
Munn & Company	636
N	
Nassau Hotel	656
National Electrical School	669
National Carbon Co.	579
National Radio Institute	583
National School of Cartooning	670
National School of Watchmaking	670
National Tuberculosis Association	644
Nestler Rubber Fusing Co., Inc.	648
New Method Mfg. Co.	646
New York Academy of Music 671,	677
New York Electrical School	655
New York Institute of Photography	659
North American Institute	651
N. W. School of Taxidermy	674
Norton Institute	677
O	
O'Brien, Clarence A.	637
Ogilvie Publishing Co. 660,	671
Owen, Richard B.	636
Ozment, C. J. 670,	674
P	
Parker, C. L.	638
Parks Woodworking Machine Co. The	648
Pathfinder Publishing Co.	650
Patterson School	655
Pelman Institute of America, The	630
Penn Merchandise Co., Inc.	670
Petroleum Engineering University	655
Plymouth Rock Squab Co.	655
Polachek, Z. H.	638
Polk, R. L. & Co.	669
Popular Chemistry	667
Porter Chemical Co., The	656
Press Guild, The	642
Publishers Classified Service, The	675
R	
Radio Association of America	677
Radio Specialty Co.	633
Randolph Radio Corp. Inside Front Cover	
Randolph & Co.	636
Ross-Gould Co.	639
Rumsey, C. L.	648
S	
S. Service	665
Scientific Apparatus Corp.	657
Shapiro, H.	669
Shipman Ward Mfg. Co.	663
Shure Radio Co.	648
Sinclair, James	653
Spors Co., F.	661
Sterling Stop-Watch Co.	667
Straus & Schram	659
Strongfort Institute	649
T	
Tamblyn, F. W.	677
Tarbell System, Inc.	585
Townsend Laboratories	654
U	
Universal Plumbing School	648
V	
Van Deventer, H. R.	638
W	
Waco Tool Works, Inc.	665
Washington School of Art	634
Washington School of Cartooning	644
Washington Show Card School	655
Whirlwind Carburetor Co.	677
Wollensack Optical Co.	646

The Year's *Greatest Book* of Fiction!
"AMAZING STORIES" ANNUAL

Featuring

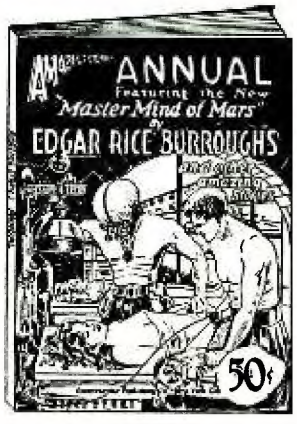
EDGAR R. BURROUGHS'

brand new story

"The Master Mind of Mars"

EDGAR RICE BURROUGHS has written many interesting stories, but we believe, for downright originality and exciting interest, "The Master Mind of Mars" is hard to equal. There is hardly a page that does not hold your interest. Once the story gets under way, hair-raising episodes seem to tumble right over each other—they come so quickly.

Besides this, the science is excellent and no matter how strangely the tale reads, it always, somehow or other, seems to have an element of truth in it.



116
PAGES OF FICTION

FULL-PAGE ILLUSTRATIONS — SIZE 9 x 12 INCHES

There has never been presented a more elaborate and thrill-provoking collection of scientific fiction. Included among the famous authors are Edgar Rice Burroughs, author of the famous Martian stories and creator of the Tarzan series; A. Merritt, author of the "Moon Pool," "The People of the Pit," etc.; Murray Leinster, well-known author who needs no introduction to AMAZING STORIES readers for the creation of his hero Burl of "The Red Dust," and "The Mad Planet"; H. G. Wells, a writer of international fame, who possesses the virtues of versatility in writing on scientifiction.

All stories are complete—116 pages of them, with full page illustrations. Size of Book 9 by 12 inches.

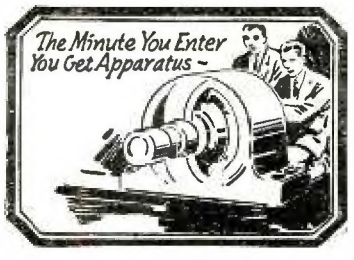
50c The Copy - ON ALL NEWSSTANDS

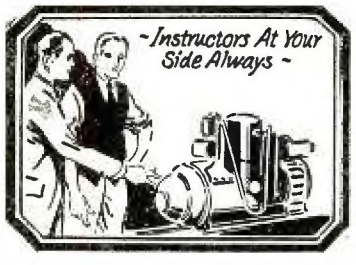
If your dealer cannot supply you order direct

EXPERIMENTER PUBLISHING CO., Inc. - - 230 Fifth Ave., New York, N. Y.

www.americanradiohistory.com

The Untrained Man





Be Trained!

Learn Electricity in 12 Weeks

No Lessons No Books

Easy, Simple, Quick NEW Way

Write TODAY

for Big New Catalog Telling You How

COYNE
ELECTRICAL SCHOOL

Not a Correspondence School
H. C. LEWIS, President, Dept. 87-83—Established 1899
500 South Paulina Street, Chicago

Now I've worked on a farm (didn't do me no harm
But I never could save up a dime),
I slaved like a horse just using brute force,
For pleasures I never had time;
It was early to bed (when the stock was all fed)
Then you'd get up at cold of the dawn,
Not once did I shirk in the rounds of my work
But one day my pep was all gone.

So I moved into town and I "clerked" all around
But the little I made was soon spent,
Yet I kept at it for there was nothing much more
I could do that would pay me a cent.
I worked as a clerk, and I worked like a Turk,
But I couldn't get nowheres at all;
Three years passed on by—my expenses were high—
So I shifted my job in the fall.

Yes, I hired out one day for a little more pay
At some laboring work on a road.
I would sweat in the sun (if it rained—got no mon)
And "dig, dig!" was all that I knowed.
The gang boss would come and bully me dumb,
He bossed us around like a brute,
Well, I stood it a year till one day I went "queer"
And busted him one on his snoot.

That finished me there (so with pockets still bare)
I worked in an auto garage,
I tinkered away (at about the same pay)
A-giving them cars a "massage";
No, I didn't know beans about them there machines
And it took me just three years to learn,
And even by then I was scarce of iron men
So my hands to a new job I'd turn.

This time I got stuck on a job with a truck—
(For driving took almost no brains.)
The wages was fair—but no money to spare—
So I left it to work on the trains.
Then I drifted from there to a factory where
I piddled around for a spell,
I tried out my hand at all jobs in the land,
And now that I've done it—aw, H———!

A man's got to train—got to train his old brain
In one trade and follow it thru,
I've tried every one—and while it was fun,
I'm busted—and you will be, too.
Yes, you will be broke—not a cent in your poke—
Unless you get trained for a trade,
Get trained by the best, then you'll pass all the rest
And roost where the Big Dough is made.

Why, there's thousands like me, just as broke as can he,
Who do all the work—for small pay.
It's so easy to drift—take a job—make a shift—
But you'll never get nowheres that way;
I wish I'd the joh that keeps husy friend Boh,
My pal of the days long ago.
He's making his pile and he's living in atyle,
I had the same chance—that I know.

But Bob TOOK his chance, when we happened to glance
At a Coyne School Electrical ad.
He said "That sure looks good. Gee whiz, if I could
I'd go there and be mighty glad."
Well, I laughed and I said "That there ad you just read
Is the bunk"—but he wouldn't agree—
He wrote to the man and he sized up his plan
And he said "That's the training for ME."

Bob was busted and so things moved along slow
He wanted to go, but was flat,
So he borrowed and went—finished—paid what was lent
And now look where Bobby is at!
He's got his own shop—while me, I'm a flop,
I never was trained—that's just why,
So take it from me, learn a trade and *you'll* be
A-sittin' on top of the sky!

Copyright 1927 By H. C. Lewis

(Note: This rhyme was sent in to me by a man who had finally come to his senses and realized that an un-trained man hasn't a ghost of a show in making money . . Big Money . . today. This man has since gone thru Coyne and is making Real Money—H. C. Lewis, President Coyne Electrical School).

Mr. H. C. Lewis, Pres.
COYNE ELECTRICAL SCHOOL, Dept 87-83
500 S. Paulina St., Chicago, Ill.

Dear Mr. Lewis: Without obligation send me your big free catalog and all details of Railroad Fare to Chicago, Free Employment Service, Radio, Areoplane and Automotive Courses that are included and how you will help me "earn while learning." I understand I will not be bothered by any salesmen.

*Name*_____

*Address*_____

*City*_____ *State*_____

www.americanradiohistory.com

SUCCESS from

CHEMICAL INSTITUTE OF NEW YORK
16 East 30th Street, New York City.

Mountoursville, Pa.

Gentlemen: I must tell you the success I have had since taking your chemistry course. My salary has been increased several times, and different industrial plants are coming to me for a little advice on different things, netting me a fair side income.

I am only sorry that I did not make my whole life study of the wonderful science.

(signed) *M. E. Van Sickle.*

CHEMISTRY

NOW is the Time to Study Chemistry

Not only are there boundless opportunities for amassing wealth in Chemistry, but the profession affords congenial employment at good salaries to hundreds of thousands who merely follow out its present applications. These applications are innumerable, touching intimately every business and every product in the world. The work of the chemist can hardly be called work at all. It is the keenest and most enjoyable kind of pleasure. The days in chemical laboratory are filled with thrilling and delightful experimentation, with the alluring prospect of a discovery that may spell Fortune always at hand to spur your enthusiasm.

Easy Monthly Payments

You don't have to have even the small price of the course to start. You can pay for it in small monthly amounts—so small that you won't feel them. The cost of our course is very low, and includes everything, even the chemistry outfit—there are no extras to buy with our course. Our plan of monthly payments places a chemical education within the reach of everyone. Write us and let us explain our plan in full—give us the opportunity of showing you how you can qualify for a highly trained technical position without even giving up your present employment.

CHEMISTRY has no equal as a profession in the modern world. There is mystery, romance and fortune awaiting the man in the laboratory.

Millions have been made by the discoverers of the chemical formula of dynamite, bakelite and many other world known chemical products.

Opportunities in the chemical profession abound on every hand—and as modern business and competition progresses the chemist will play an important part.

Profit by the experience of Mr. Van Sickle and many others, resolve to study chemistry NOW.

YOU CAN LEARN AT HOME

To qualify for this remarkable calling requires elaborate specialized training. Formerly it was necessary to attend a university for several years to acquire that training, but thanks to our highly perfected and thorough system of instruction, you can now stay at home, keep your position, and let us educate you in Chemistry during your spare time. Even with only common schooling you can take our course and equip yourself for immediate practical work in a chemical laboratory. Dr. Sloane gives every one of his students the same careful, personal supervision that made him celebrated throughout his long career as a college professor. Your instruction from the very beginning is made interesting and practical, and we supply you with apparatus and chemicals for performing the fascinating analyses and experimental work that plays such a large part in our method of teaching, and you are awarded the Institute's official diploma after you have satisfactorily completed the course.

EXPERIMENTAL EQUIPMENT FURNISHED TO EVERY STUDENT

We give to every student without additional charge this chemical equipment, including forty-nine pieces of laboratory apparatus and supplies, and forty different chemicals and reagents. These comprise the apparatus and chemicals used for the experimental work of the course. The fitted heavy wooden box serves not only as a case for the outfit but also as a useful laboratory accessory for performing countless experiments.

T. O'CONOR SLOANE,
A.B., A.M., LL.D., Ph.D.

Noted Instructor, Lecturer and Author. Formerly Treasurer American Chemical Society and a practical chemist with many well known achievements to his credit. Not only has Dr. Sloane taught chemistry for years but he was for many years engaged in commercial chemistry work.

Special 30 Day Offer

Besides furnishing the student with his Experimental Equipment, we are making an additional special offer for a short while only. You owe it to yourself to find out about it. Write today for full information and free book "Opportunities for Chemists." Send the coupon right now while it is fresh in your mind. Or just write your name and address on a postal and mail it to us. But whatever you do, act today before this offer is withdrawn.

DON'T WAIT—MAIL COUPON NOW!

Chemical Institute of New York
Home Extension
Division 11
16-R- East 30th St.
New York, N. Y.

CHEMICAL INSTITUTE OF NEW YORK S.I. Nov.
Home Extension, Division 11
16-R—East 30th Street, New York City.

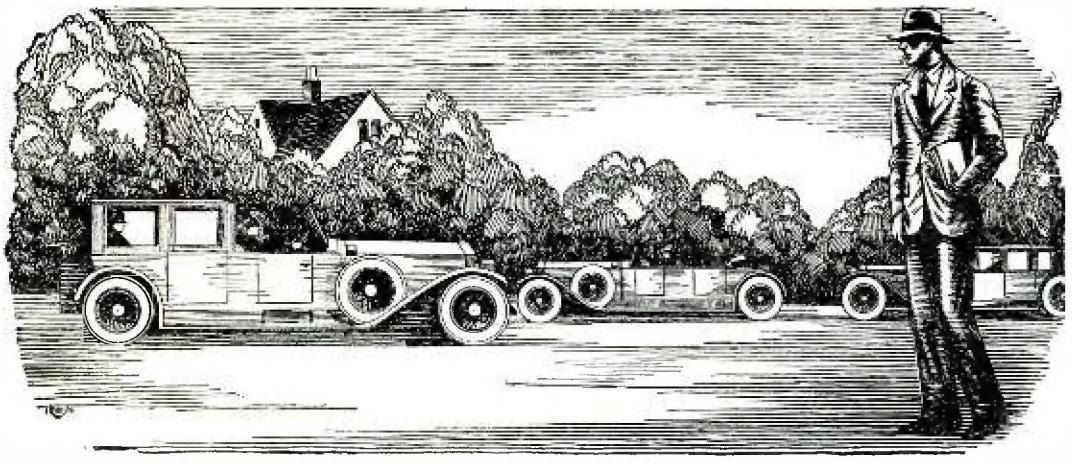
Please send me at once, without any obligation on my part, your free Book "Opportunities for Chemists." and full particulars about the Experimental Equipment given to every student. Also please tell me about your plan of payment and your special 30 day offer.

NAME .....

ADDRESS .....

CITY ..... STATE.....

www.americanradiohistory.com



Many times in the old days, while I trudged home after work to save carfare, I used to gaze enviously at the shining cars gliding by me, the prosperous men and women within. Little did I think that inside of a year, I, too, should have my own car, a decent bank account, the good things of life that make it worth living.

I Thought Success Was For Others

Believe It Or Not, Just Twelve Months Ago I Was Next Thing To "Down-and-Out"

TODAY I'm sole owner of the fastest growing Radio store in town. And I'm on good terms with my banker, too—not like the old days only a year ago, when often I didn't have one dollar to knock against another in my pocket. My wife and I live in the snuggest little home you ever saw, right in one of the best neighborhoods. And to think that a year ago I used to dodge the landlady when she came to collect the rent for the little bedroom I called "home"!

It all seems like a dream now, as I look back over the past twelve short months, and think how discouraged I was then, at the "end of a blind alley." I thought I never had had a good chance in my life, and I thought I never would have one. But it was waking up that I needed, and here's the story of how I got it.

I WAS a clerk, working at the usual miserable salary such jobs pay. Somehow I'd never found any way to get into a line where I could make good money.

Other fellows seemed to find opportunities. But—much as I wanted the good things that go with success and a decent income—all the really well-paid vacancies I ever heard of seemed to be out of my line—to call for some kind of knowledge I didn't have.

And I wanted to get married. A fine situation, wasn't it? Mary would have agreed to try it—but it wouldn't have been fair to her.

Mary had told me, "You can't get ahead where you are. Why don't you get into another line of work, somewhere that you can advance?"

"That's fine, Mary," I replied, "but *what* line? I've always got my eyes open for a better job, but I never seem to hear of a really good job that I can handle." Mary didn't seem to be satisfied with the answer, but I didn't know what else to tell her.

It was on the way home that night that I stopped off in the neighborhood drug store, where I overheard a scrap of conversation about myself. A few burning words that were the cause of the turning point in my life!

With a hot flush of shame I turned and left the store, and walked rapidly home. So that was what my neighbors—the people who knew me best—really thought of me!

"Bargain counter sheik—look how that suit fits," one fellow had said in a low voice. "Bet he hasn't got a dollar in those pockets." "Oh, it's just 'Useless' Anderson," said another. "He's got a wish-bone where his backbone ought to be."

As I thought over the words in deep humiliation, a sudden thought made me catch my breath. Why had Mary been so dissatisfied with my answer that "I hadn't had a chance?" *Did Mary secretly think that too?* And after all, wasn't it *true* that I had a "wish-bone" where my back-bone ought to be? Wasn't that why I never had a "chance" to get ahead? It was true, only too true—and it had taken this cruel blow to my self-esteem to make me see it.

With a new determination I thumbed the pages of a magazine on the table, searching for an advertisement that I'd seen many times but passed up without thinking, an advertisement telling of big opportunities for trained men to succeed in the great new Radio field. With the advertisement was a coupon offering a big free book full of information. I sent the coupon in, and in a few days received a handsome 64-page book, printed in two colors, telling all about the opportunities in the radio field and how a man can prepare quickly and easily at home to take advantage of these opportunities. I read the book carefully, and when I finished it I made my decision.

WHAT'S happened in the twelve months since that day, as I've already told you, seems almost like a dream to me now. For ten of those twelve months, *I've had a Radio business of my own!* At first, of course, I started it as a little proposition on the side, under the guidance of the National Radio Institute, the outfit that gave me my Radio training. It wasn't long before I was getting so much to do in the Radio line that I quit my measly little clerical job, and devoted my full time to my Radio business.

Since that time I've gone right on up, always under the watchful guidance of my friends at the National Radio Institute. They would have given me just as much help, too, if I had wanted to follow some other line of Radio besides building my own retail business—such as broadcasting, manufacturing, experimenting, sea operating, or any one of the score of lines they prepare you for. And to think that until that day I sent for their eye-opening book, I'd been wailing "I never had a chance!"

NOW I'm making real money. I drive a good-looking car of my own. Mary and I don't own the house in full yet, but I've made a substantial down payment, and I'm not straining myself any to meet the installments.

Here's a real tip. You may not be as bad off as I was. But, think it over—are you satisfied? Are you making enough money, at work that you like? Would you sign a contract to stay where you are now for the next ten years, making the same money? If not, you'd better be *doing* something about it instead of drifting.

This new Radio game is a live-wire field of golden rewards. The work, in any of the 20 different lines of Radio, is fascinating, absorbing, well paid. The National Radio Institute—oldest and largest Radio home-study school in the world—will train you inexpensively in your own home to know Radio from A to Z and to increase your earnings in the Radio field.

Take another tip—No matter what your plans are, no matter how much or how little you know about Radio—clip the coupon below and look their free book over. It is filled with interesting facts, figures, and photos, and the information it will give you is worth a few minutes of anybody's time. You will place yourself under no obligation—the book is free, and is gladly sent to anyone who wants to know about Radio. Just address J. E. Smith. President, National Radio Institute, Dept. OD-6 Washington, D. C.

J. E. SMITH, President,
National Radio Institute,
Dept. OD-6 Washington, D. C.

Dear Mr. Smith:

Please send me your 64-page free book, printed in two colors, giving all information about the opportunities in Radio and how I can learn quickly and easily at home to take advantage of them. I understand this request places me under no obligation, and that no salesmen will call on me.

Name .....

Address .....

Town ..... State.....

www.americanradiohistory.com

The Companion *of every* Radio Set!

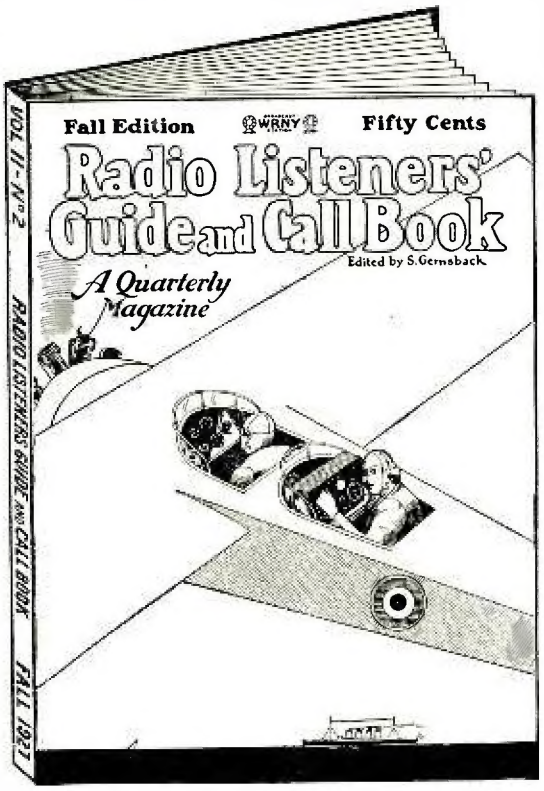
Here's the first and most important book for every set owner and builder!

Like a Tourist Guide—a Railroad Time Table—an Instruction Book—and a Construction Manual all in one—that is what the new "Fall Edition" of RADIO LISTENERS' GUIDE and CALL BOOK is to a Radio Listener.

It guides you in touring the Air—with its most complete, up-to-date and comprehensive list of Broadcast Stations the World over.

It gives you the power, the Wavelength and the Ownership of all stations.

It contains a number of pages devoted exclusively to hints and practical suggestions on keeping a set in good order.



—and it publishes a wide selection of the very latest and finest Radio Circuits with complete building instructions.

In this issue is complete information on the renowned "STROBODYNE," the amazing circuit from France.

176 pages in all. Hundreds of illustrations. Size 9 x 12 inches.

Get your copy today—Keep it by your set—You'll find it helpful every day of the week.

50c THE COPY

ON ALL NEWSSTANDS

If your newsdealer cannot supply you

USE THIS COUPON

CONSRAD CO., Inc.,
230 Fifth Ave., New York.

Gentlemen: I enclose 50c. for one copy of the fall edition of RADIO LISTENERS' GUIDE and CALL BOOK.

Name .....

Address .....

City, State .....

15c The Copy

Published Monthly. Beautifully illustrated. Size 9x12 inches. Special Colored Covers.

YOU---

owe it to yourself to read this new magazine—

That tells of hundreds of ways to make money in Spare-time.

15c On All Newsstands

If your dealer cannot supply you use this coupon

CONSRAD CO., Inc.,
230 Fifth Ave., New York.

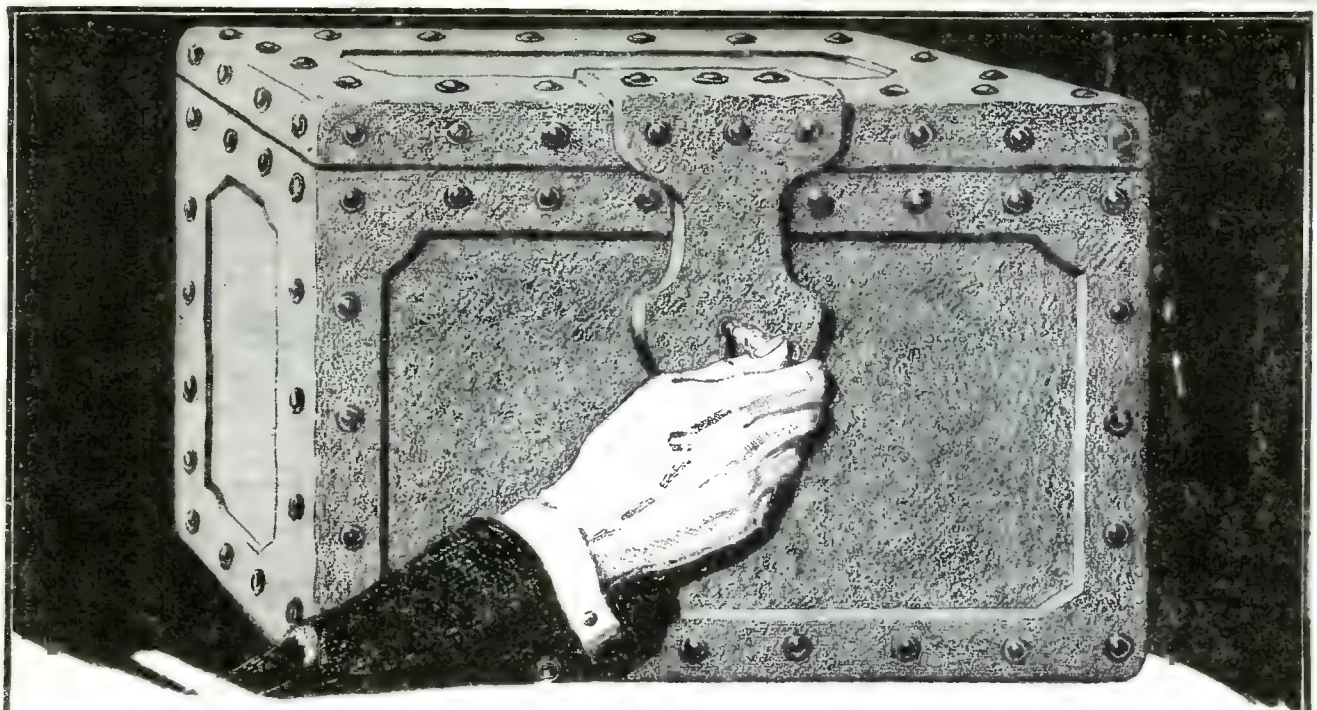
Gentlemen: I enclose $1.50 for one year's subscription (12 issues) of SPARE-TIME MONEY MAKING.

Name .....

Address .....

City, State .....

www.americanradiohistory.com



Unlocking For You
the Age Old
Secrets of Magic

Baffling secrets of the world's greatest magicians—mysteries never before divulged—supernatural effects of the Orient—massive stage illusions—the most priceless, most treasured Secrets of the Magic Profession now—*for the first time*—disclosed to **YOU** in the great Tarbell Course in Magic. Learn to perform like a real magician in a short time—in your spare time—at home. Be the life of every party—the center of every crowd, wherever you go. Business and social success are YOURS when you know Magic. It's *easy* with the Tarbell System!

Astonish Your Friends

Study the first lesson and your friends will be amazed at your wonderful Magical powers. You will have that Magnetic power that gives you instant popularity in any crowd. Everyone will marvel at your apparently supernatural, psychic power. YOU possess this talent now! Surprisingly *easy* to bring it out. Send the coupon below now — and find out how easily you can do it.

Earn $250 to $1000 a Month

From Impromptu Tricks through Sleight of Hand to Great Stage Illusions—EVERYTHING is taught to you so that you can go right out and MAKE BIG MONEY WITH MAGIC. There is a tremendous demand for Magic Entertainment. Clubs, churches, schools, conventions, theaters are on the lookout for Magicians—and they pay $25 to $100 for perhaps half an hour's program. Keep your job and make a lot of EXTRA MONEY on the side. Just master a few easy tricks. Salesmen—businessmen—professional men—all can use Magic to gain popularity and profits. Easy for YOU to make $250 to $1000 a month!

Tarbell System, Inc., Studio 14-28
1926 Sunnyside Ave., Chicago, Ill.

Please send me your big FREE illustrated and colored booklet giving full information on the Tarbell System of Magic. No obligation on my part whatever.

Name.....

Address.....

City and State.....*Age*.....

Mail Coupon!

You can now get this great course, endorsed by the world's greatest magicians, at a special low price. But you have to *act quickly* to get in on this offer. Write today SURE!

Tarbell System, Inc., Studio 14-28
1926 Sunnyside Avenue. Chicago, Ill.

www.americanradiohistory.com

BUILD OLD IRONSIDES

for $6.98

$6.98

You can build a model of the United States Navy's most famous fighting vessel in a few hours of pleasant pastime.

Size: 30 inches high; 32 inches long; 10 inches wide. An exact duplicate of the U. S. S. Constitution in every detail.

Fifteen year old Carl Rayborn built a model of the Constitution using only our cut-to-fit and ready to assemble parts as supplied in our kit for $6.98. He submitted the completed model in a contest by the publishers of Science and Invention, and it

WON FIRST PRIZE

in competition with a thousand ship models submitted to the magazine by builders from all parts of the country. Previous to building the model of Old Ironsides, Carl Rayborn had never constructed a ship model in his life.

You, too, can build a prize winning model from our cut to fit and ready to assemble parts of historic ships, including the Constitution, the Mayflower, the Santa Maria and the La Pinta. Prices for the kits of parts range from $4.98 to $6.98.

You need not know anything about ship building or carpenter work in order to build one of these ships. No special knowledge of ship model building is necessary either. THE WORLD'S LARGEST BUILDERS OF SHIP MODELS AND MELODY SHIPS WILL supply all the parts from the hull down to the smallest piece of rigging, all cut to fit and ready to assemble. You cannot go wrong. Diagrams and plans of parts that are included with each kit tell exactly what to do with each part.

These plans show you step by step just how the model is constructed. Everything is made so simple that even a small child can build a beautiful model.

All you need is a small hammer to tap the parts into place. Here is part of the instructions copied word for word from the diagram and instruction sheet that goes with the kits. "Take part No. 57 place it in front end of part No. 56 and tap lightly with a hammer. Next take part No. 58 and place it up against No. 57 and tap it with a hammer to bring it into place."

Easy! Nothing simpler. The instructions are like that from beginning to end. Do this and that and before you realize it a beautiful ship model has grown before your eyes.

The model of the Constitution is exact in every detail. The hull, masts, spars, riggings, cannons and anchors are exactly like those on the original ship. Those who have constructed models from our cut to fit parts are so well pleased with them that they will not sell them for $50 or even $100. We have letters from all over the world telling us how much pleasure it was to build these models and the enticing money offers the builders have received for them when completed. Many persons have built up a wonderful business selling completed models which they have made from our kits.

If, after assembling the model you do not think it worth many times the purchase price, return it to us in good condition and we will gladly refund your money.

Write for our free beautifully illustrated catalog which contains photographs of all our models together with complete details and price of each. We will send this catalog without obligation to you. Fill in the coupon below and we will act upon it immediately.

Canadian Prices Slightly Higher. Send all Canadian Orders to Canadian Branch.

MINIATURE SHIP MODELS, Inc.
3818-20-22-24 Baring St., Philadelphia, Pa.
***Canadian Branch:* 1485 Bleury St., Montreal, Canada**

MINIATURE SHIP MODELS, Inc. DEPT S2
3818-20-22-24 Baring St., Phila., Pa.

Please send me the complete parts, cut to fit, and ready to assemble for the model Constitution. I will pay postman $6.98 plus postage (a few cents).

PLEASE PRINT NAME AND ADDRESS PLAINLY.

Name .....

Street or R. F. D. .....

City .....

State .....

www.americanradiohistory.com

The golden glories of the AIR-

Money—Fame—Opportunity—Friends

Opportunities are biggest in new industries. They are more numerous—more easily seized. Aviation is the outstanding new industry of the day. Its doors are open wide to wide-awake, ambitious men and women. Our Free booklet tells how and why.

Aviation is broadcasting for workers—not only for those who have the fire to blaze sky-trails over the world, but for thousands of others in the many fascinating, money-making positions doing ground work. There is no need for you to fly to get rich in Aviation. Pioneers in the automobile field made fortunes without driving racing cars.

But you must have training to get into one of the 53 different lines of interesting work in this thrilling new business. You must understand the fundamentals of Aviation—know the terms, know your way about.

Aviation Institute makes it easy for you to secure training. You do it at home, in your spare time—without interfering with your present occupation—with no loss of time nor money. You need no especial experience, no training in mechanics, the automobile or kindred lines.

The instructions are simple, practical, workable. Under the guidance of Lieut. Walter Hinton, first trans-Atlantic Pilot of N. C. 4 fame, and his staff you are home-trained to take your place in Aviation. You are ready to become a pioneer in a rich new field filled with golden glories—and to pioneers go the plums.

Think of the thousands of openings just crying for you in the livest business of the age. Think of the 4000 airports in America where riggers, inspectors, mechanics and helpers are needed. Think of all the giant factories, building planes and parts, breathless with energy, crying for men. Already there are 6000 privately owned planes here.

Commercial aviation is here. We fly more miles than any other country. Five railroads are going into air transportation. The Guggenheim Foundation is financing air passenger lines. There are 20 air mail routes already operating. Ocean steamship lines are testing air mail planes from ship to land. The American Express Air Service is now running.

Now is the time to get into Aviation and expand with its rapid growth. Get a kick out of your work—earn big money—meet the best people—travel—in short, get ahead in the world.

AVIATION INSTITUTE OF U. S. A.

Lieut. Walter Hinton, *President*

1115 Conn. Ave., N. W., Suite 311 Wash., D. C.

Lieut. Walter Hinton, First Trans-Atlantic Pilot, N. C. 4 fame. President of Aviation Institute of U. S. A., and Prominent in Development of the Industry.

53 Kinds of Jobs

There is endless variety to the different lines of opportunities in Aviation. Not only are pilots, instructors, commercial operators, wireless experts and mechanics needed in the air, but the industry is hungry for wood workers, draftsmen, engineers, riggers, designers, electricians, photographers, salesmen, statisticians, tool makers, executives, accountants, glue experts, chemists, glass workers and other lines, totaling 53. Your chance is all ready and waiting for you. Mail coupon for full information.

First Flight Free

If you wish to become a pilot, after you graduate, final flying instructions are given here in Washington at Hoover Field or at other fields all over the United States in cooperation with the Institute. Five to ten hours with an instructor and you can fly alone. First flight free to graduates. Get all the facts. Do it now.

This book is FREE

It tells all

AVIATION INSTITUTE OF U. S. A., Suite 311
1115 Conn. Ave., N. W., Washington, D. C.

You may send me without obligation a Free copy of "Aviation and You."

Send for it

Name.....

Age (Not under 16).....

Street.....

City.....State.....

www.americanradiohistory.com

FREE 10 DAYS TRIAL

THE NEW IMPROVED **INKOGRAPH** "PENCIL POINTED PEN" **$1.50**

The Perfect Writing Instrument

GREATEST VALUE EVER OFFERED

NEVER before has any manufacturer of a standard writing instrument which is guaranteed to give perfect satisfaction, offered you so great a value. Remember, the Inkograph answers the purpose of both pen and pencil combined. Its point is shaped like a fine lead pencil point and writes with ink free and easy without a miss, skip or blur. The steady uniform flow of ink actually improves your handwriting. Won't blot, scratch, leak or soil hands.

You who already possess a standard fountain pen will find the Inkograph a most valuable addition to your writing equipment, for it will do everything any fountain pen can do and many very important things which it is impossible to accomplish with any fountain pen at any price.

Combines the Best Features

of both pen and pencil, minus the weak points or both, plus improvements not found in either.

The lead pencil smudges, the point breaks and its writing soon is obliterated. Most fountain pens skip, scratch, flood, clog, leak, blot, soil hands and clothing. The old stylographic ink pencil dries up, balks, blots, writes heavy, flows unevenly and is never reliable. The Inkograph feeds as fast and uniform on the 20th page as it did on the first

Cannot Leak

Not the tiniest drop of ink will spill, although one filling is sufficient to write thousands of words. Will write on any quality of paper.

Makes 3 to 4 Carbon Copies

at one time with original in ink. Bear down as hard as you like without fear of bending, spreading, injuring or distorting its 14 Kt. solid gold point. Are you a salesman?—use an Inkograph, make out your orders in ink and retain a duplicate for your records. Do you wish to keep a copy of your private correspondence? — use an Inkograph. Do you do office work which requires clear carbon copies?—use an Inkograph. Do you make out bills or sales slips?—use an Inkograph and make a permanent original in ink with carbon copies. You can permit any one to write with your Inkograph, for no style of writing can affect the Inkograph point as it will a fountain pen.

Draws Lines to a Ruler

Without smearing, smudging or blurring the paper. Writes with any color of ink.

Requires No Blotter

The ink dries as fast as you write, because the flow is fine, even and uniform.

Patent Automatic Feed

Prevents clogging. No complicated mechanism to clean or get out of order. A year's guarantee certificate with full directions accompanies each Inkograph and is your absolute protection.

An Instrument of Refinement

In appearance, quality, workmanship and material it is the equal of writing instruments which sell for a great deal more. It's beautifully highly polished finest quality of black, hard rubber, it's 14 Kt. solid gold point and feed, safety screw cap, self-filling lever and clip make it an instrument of distinctive elegance and refinement. Each Inkograph is designed and finished to please the eye and fit the hand of all.

You Who Are Dissatisfied With Your Fountain Pen

Try the Inkograph—remember, all we ask you to do is try it, for if it does not prove thoroughly satisfactory and if it is not handier and does not write smoother and is not far superior to any fountain pen you ever owned, whether it cost $5, $6, $7 or $8, return the Inkograph to us and we'll refund your money—no questions asked.

Inkograph Co., Inc.
197-57 CENTRE ST.
NEW YORK, N. Y.

That hard smooth round ball-like point, which glides with ease over the coarsest paper and makes possible writing in ink as rapidly as with the softest lead pencil.

SAME SIZE AS $7 & $8.75 FOUNTAIN PENS

$1000 REWARD

to anybody who can prove that these testimonials were solicited by us.

Inkograph has proven so satisfactory and has elicited considerable favorable comment am enclosing money order, please send me three more. T. J. Trow, Traveling Claim Agent, Joplin, Mo.

The Inkograph fully justifies all claims you make. I own a Waterman but Inkograph is far preferable. Frank R. Sargent, Oakland, Calif.

You have one of the best writing instruments I ever used regardless of price. I use the lowest grade stationery and there is never a blot or scratch because of its round smooth point. It is a wonderful invention. L. H. Orley, Albano, Va.

Oh boy, I am tickled skinny to have the Inkograph, it's a darling. I can now make carbon copies in taking orders and send original in ink to factory instead of a penciled sheet. It surely flows over the paper as if it was grease instead of ink. No trouble at all and a thing I could not do before to trace straight lines very fine and clean. No smear, no muss of any kind. It's just great. E. A. Simms, Jersey City, N. J.

My Inkograph is the smoothest writing instrument with which I have ever written. That is saying a lot. I am a teacher by profession. I have a $7.00 pen and another that cost more than the Inkograph, but Inkograph is better than either. It is the greatest improvement in writing instruments since the Babylonians recorded their thoughts on clay tablets with a triangular pointed reed. John R. Atwell, Chadwick, N. C.

My Inkograph is the first and only writing utensil I ever owned that I can use with pleasure. To be without it for any time would upset my business day. It has always worked perfectly. I have never had any difficulty with it. Arthur L. Fox, Centerville, Mich.

I am a bank teller, have used all kinds of fountain pens but can honestly say for my work I never found a pen so easy and tireless to write. You can pick it up any time in any position and write immediately and all numbers and words will be the same. Try and do it with any other pen. My buddies all agree that is best for our work. O. R. Morley, Allentown, Pa.

Delighted: It writes bully—you have invented a pen that is perfection. It is so much more rapid than my $9.00 fountain pen. I wish you abundant success. S. L. Carlton, Aurora, Ill.

I am very well pleased with my Inkograph. It is just what I have been looking for. I have had several ink pencils but nothing like the Inkograph; it writes like the point was greased and it makes no difference what kind of paper, it is fine for shipping tags. S. T. Jarrett, Harrisville, W. Va.

The Inkograph is all that you claim it to be. Enclosed find order for two. Robert Heller, Craigsville, Pa.

The Inkograph, I am thoroughly convinced, is the best writing instrument I have ever used. It is sure, sane and clean and always ready to use. I am very well pleased with it. J. E. Rampton, Pensacola, Fla.

Received my Inkograph. Am surprised to know how well I can write with it. The Inkograph is a wonderful little writer, it's my friend now for good penmanship. I am writing this letter with it; can you tell the difference between Inkograph and pen letters? I Can is my answer. C. R. Fuller, Patterson, Mo.

I received my Inkograph with which I am writing this letter. I have purchased at least one dozen ink pencils. Yours seems to be the only one that gives perfect satisfaction. I believe you have solved the problem of the perfect writing instrument. Dr. Richard T. McLaury, Dunkirk, Ind.

The Inkograph is truly the best pen I ever had the pleasure to use barring no price or make of pen, after I take into consideration the high price I usually paid for a Parker, or a Waterman pen, I cannot see how such a low priced pen as the Inkograph can be put on the market and give such unusual service. Harvey L. Winston, Brentwood, Calif.

In making out local requisitions, it is necessary to make an original and two carbon copies on very heavy paper, and the Inkograph does this twice as well as the hardest indelible pencil, and is much neater and the original is much more legible. Wm. L. Fortney, Placerville, Ia.

Your Inkograph is everything you state. It is just wonderful. So send me two more. Arthur Olicott, Tucker, La.

Gave pen thorough tryout. Enclosed find sample of work I have to perform. Have been using pencil. Never got entire satisfaction. Hard pencil makes original too pale and soft pencil makes poor copy. I am highly pleased. S. M. Cooper, Inquiry Division, P. O., South Bend, Ind.

I found the Inkograph all you represent it to be and I was very well satisfied with it. I made a great mistake when I bought the Inkograph, as I did not take out Loss or Theft Insurance on the pen, for the pen is gone. I am writing this to ask that you send me another Inkograph by return mail, charges C.O.D. I can recommend the Inkograph very highly to anyone who needs a pen which will stand up under very hard usage. George B. Moore, Columbia, Fla.

It sure has improved my hand writing—I never took home any medals for penmanship but I can almost read my own writing since I got this pen. M. F. Johnson, Medina, Wis.

I want to thank you for the return of my Inkograph pen, which you repaired for me. I feel rather lost without this pen in my pocket. I prefer it to any pen I ever carried principally because of the ease with which one can write with it, not having to be careful whether you slide the pen to the North, East, South or West, it flows freely in all directions. Wm. B. Brown, New York, N. Y.

Received my Inkograph and same is filling a long-felt want. Kindly send two more of the same style by parcel post collect as soon as possible. Theodore Priestley, Akron, Ohio.

I bought one of your pens a year ago. You sure build the best pen on the market to my notion. Frank R. Ellsworth, Fargo, N. D.

I wouldn't take $5.00 for the pen I am writing this letter with. I have a good fountain pen but don't write any more with it. I am proud of the Inkograph and that I can say this to you and mean every word of it. R. H. Wilson, Beckley, W. Va.

DEALERS

Stationery Stores, Drug Stores, Department Stores, etc., send for our catalog and trade prices.

AGENTS

Sell Inkographs, make bigger profits, more sales, without investment. Quicker commissions, popular prices, no competition. Send for an Inkograph or write for special sales plan booklet.

SEND NO MONEY

Your name and address are sufficient. Pay postman $1.50, plus postage on delivery. When remittance accompanies order, Inkograph will be sent postage prepaid. If within ten days the Inkograph does not prove satisfactory return it and we'll refund your money without further correspondence. It is because we are sure the Inkograph will meet your requirements to perfection that makes it possible for us to make you so attractive an offer.

This Coupon Properly Filled Out Is all that's necessary. Send it today and procure one of the New Improved Inkographs on a 10-Day Free Trial, with no strings tied to it. If you prefer smaller size with ring on cap to be carried on watch chain or ladies' soutoir, mark X here ☐

INKOGRAPH CO., Inc., 197-57 Centre St., New York, N. Y.

Gentlemen: You may send me your Inkograph. I will pay postman $1.50, plus postage on delivery.

Name.....

Address.....

City..... State ..

www.americanradiohistory.com

Volume XV
Whole No. 175

Science and Invention

November, 1927
No. 7

HUGO GERNSBACK, *Editor-in-Chief*
H. WINFIELD SECOR, *Managing Editor*
DR. T. O'CONOR SLOANE, PH.D., *Associate Editor*
Editorial and General Offices, - - - 230 Fifth Avenue, New York

"Those Who Refuse to Go Beyond Fact Rarely Get As Far As Fact" - - - HUXLEY

WHAT'S WRONG WITH SCIENCE?

By HUGO GERNSBACK

THERE has recently been an outpouring, in many quarters, to the effect that science is accelerating the human pace to such an extent that we no longer are able to cope with its progress, and that sooner or later there will be a terrific calamity. One well-known authority goes so far as to ask for a ten year holiday, during which time there should be no scientific progress, no research work, no inventions. How the inventor of this idea would achieve this respite is not told, because you might as well try to stop the revolution of the earth as to attempt to prevent advancement in any direction.

Another authority, quite sincerely, laments the fact that great inventions are going begging. He reviews the case of the trans-Atlantic telephone, which it took years to perfect and in which many millions of dollars are invested. He cites the fact that from January 7th to May 17th of this year the number of calls was only 893 altogether. Since this time, the number of trans-Atlantic calls has been still further reduced, so that now it is only seven calls a day. He laments the fact that a handful of calls a day seems to be the pitifully inadequate use of this instrumentality that has been handed the peoples of both sides of the ocean, so to speak, on a gold platter.

He further goes on to show that, although it is possible to send photographs across the country and overseas, but few persons are availing themselves of this splendid service. Further on he mentions the fact that while television has already arrived no one knows what to do with it. There seems to be, in his mind, no use for this invention. In his opinion there could not be a practical use for television.

Then he speaks of the airplane, and laments the fact that it would never occur to an American business man to think in terms of airplanes, because we still have the railroad with us and, in his opinion, the airplane can never compete with the railway.

A great deal of nonsense similar to this is being pandered around year in and year out, mostly by those good individuals who are invariably out of date with their surroundings, and who also can not read the future by what has gone on in the past.

When the telephone first was invented, some of the greatest people of the day denounced it as a foolish toy. No one could see its usefulness. It took at least ten years for the telephone to get anywhere at all, and fully twenty years before it attained universal use. It was just the same with the telegraph and the phonograph. It took radio ten years to reach a goal, and not until the radio telephone came along did the popularity of radio suddenly leap to the fore. That took some twenty years from the time the invention was made.

There is hardly an invention that does not go begging FOR A TIME, but in the end, if the invention is at all meritorious, it will pay some one handsome dividends, and often great fortunes.

An invention, always provided that it is practical, fills a need, and does something better than it has ever been done before, may not immediately set the world on fire, and indeed it seldom does. But sooner or later it takes the lead and reaps a harvest.

The average human being has a tremendous amount of inertia, and is about the most sluggish thing in the universe. It takes a long time to convey to human beings the fact that things can be done better and cheaper. The human being is essentially an animal of habit, and it is difficult to start him along a new track. It usually takes a long time to convince an individual that certain things are to his advantage. He is usually skeptical about it, and it takes time to overcome this inertia. That is the reason, of course, why the trans-Atlantic telephone is not used more, and why more pictures are not being telegraphed.

One should not, however, come to the snap judgment that such will be the case forever. There is no question at all in my mind that the trans-Atlantic telephone will become exceedingly popular in time to come, as will be the case with telegraphed and radioed pictures. Of course, at the present time, the owners, as is usually the case with utilities of this kind, have not found their economic level as yet. At the present time it costs $25 per minute to talk to London from New York. There was a time when local calls were ten cents. They have been reduced to five cents, and may be still further reduced. Every time there has been a reduction, business has leaped ahead.

It will be thus with the trans-Atlantic telephone and with wired pictures, and when the rates are reduced to make it sufficiently attractive, people will use the service. And, incidentally, the inventions will go begging no longer, but will coin handsome dividends.

The same thing, of course, holds true of television, of which we have not as yet scratched the surface, and the airplane. It is true that television has as yet not been perfected, from a commercial angle, but as I have said so often, it will be developed during the next few years, when it will be possible to have a television attachment on every telephone in the land, and when every radio set will have its own television attachment, so you can see what is going on anywhere, wherever radio broadcasting is done.

As far as the airplane is concerned, it is being used to a considerable extent in Europe, and we already have made a start here, not only for passenger, but for express and freight service. In short, the answer to the question, "What is wrong with Science?" is that there is nothing wrong with Science. The trouble is with the human beings who lag behind and cannot adapt themselves to the change.

Mr. Hugo Gernsback speaks every Tuesday at 9.30 P. M. from Station WRNY on various scientific and radio subjects.

www.americanradiohistory.com

Is This Possible?

Can the Young Lady See as Much of Herself in a Plain Mirror as is Indicated on the Front Cover?

By JOSEPH H. KRAUS

THE problem of viewing oneself in the mirror is frequently a difficult one, as many of the fairer sex know. Girls frequently have to move the mirror around in order to see their whole face while, judiciously or otherwise, applying the

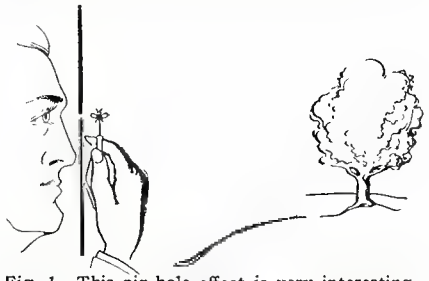


Fig. 1—This pin-hole effect is very interesting. Looking at a close object through a pin hole, the object appears magnified. Looking at a distant object, it appears smaller.

cosmetics to enhance their beauty. In order to see her whole face, a girl should measure the size of her face from side to side and top to bottom and then secure a mirror just half this size. In that way she can view her entire make-up at one and the same time. The peculiar point which is to be brought out here is that it is absolutely impossible to see more than twice the size of the mirror, regardless of how far that person may be away from the mirror. We are assuming here, of course, that we are using the plain mirror, not the convex or concave type of mirror with which entirely different results are obtained. It thus becomes impossible for anyone to see themselves in a plain mirror as is indicated on the cover.

You can easily make a few tests along this line yourself. Place a mirror on the table in front of you and then move back. In order to actually demonstrate the size of the image, hold a ruler in front of your nose in a vertical position midway between the eyes, of course. When close to the mirror, you will not see as much as you do as you recede from that point, but at any event you will never be able to see more than twice the height of the mirror on the ruler scale. If the mirror measures 4 inches, you will not be able to see 10 inches of the ruler, but only 8.

This factor is doubly interesting when one places the mirror at an angle of 45° and looks at some distant objects. He will find that he can see almost the entire city in a small mirror if that mirror is held close to the eyes, but as the mirror is moved further from the eyes, the vision becomes more limited, until finally only one object will be apparently centered in the glass and, stranger still, is an apparent magnification of the object as the mirror is moved further away from the eyes. This is an illusion which is not difficult to explain.

Size of distant objects is generally compared with other known sizes. Here we have a mirror bordered by a frame. The image of the object apparently in the mirror is compared with the edges of the frame and, as the mirror is withdrawn, one single image becomes apparently larger when we also compare it with the mirror border. It is for this reason that we obtain an illusion of enlargement. The reasons, therefore, are explained in the figures at the end of this article which show closely that, regardless of how far away the eye is from the mirror, as long as the object is the same distance from that mirror, the image is constant and seems as far back of the mirror as the object is in front of it and of the same size as the object. Mirrors frequently play strange tricks upon us, particularly in regards to their poor reproduction of color values.

It has frequently been said that were we ever able to produce a perfect mirror, we would not see the mirror. This lesson is brought home at times in some of our amusement resorts where mirrors are placed at 45° angles, at the end of a passage but dimly lighted. Those carelessly walking through this passage run head on into the mirror.

Another strange mirror experiment can be made with the ordinary concave shaving mirror. This produces a variety of images

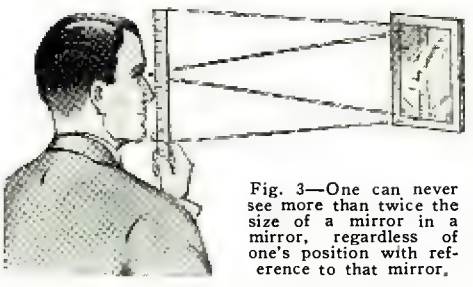


Fig. 3—One can never see more than twice the size of a mirror in a mirror, regardless of one's position with reference to that mirror.

which are quite strange. For instance, when the object is an infinite distance beyond the mirror, and consequently beyond the center of curvature of the mirror (because the center of curvature of the average shaving mirror is only a short distance away from the mirror itself), the image produced is real. That is, it can be thrown upon a sheet of paper. It is in front of the mirror and smaller than the object. If the object or the person looking at the mirror should arrive at the center of curvature of the mirror, the image is real, inverted, and of the same size as the object and in the same plane of the object. Should the object be made to approach the mirror still further, the image produced is again real, inverted and larger than the object, but here the image is beyond the center of curvature. Now, when the object is at the principal focus, the rays which are reflected from the mirror are parallel to the principal axis of the mirror and no image is formed. And lastly, with this same mirror, when one approaches so closely that he is between the principal focus and the mirror, a virtual image is produced; that is, the image is in back of the mirror. It is erect and larger than the object.

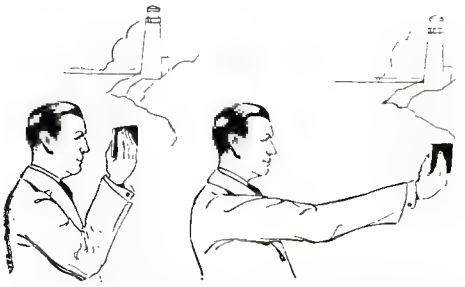


Fig. 2—If a mirror is held at a 45° angle, and a distant scene observed, and then the mirror is pushed away from the eyes, and the same scene contemplated, it appears to get larger. This is an illusion.

With convex mirrors such as are employed as automobile mirrorscopes, recourse is had to both the plain and convex mirrors. In the convex mirror the image is always virtual; that is, it is in back of the mirror and it is always erect and smaller than the object.

The only possibility then of duplicating the effect on the front cover would be to employ a convex mirror where the image produced would, as specified, be erect and smaller than the object and, consequently, more of the object than twice the size of the mirror could be seen.

This brings to mind another peculiar effect, namely, that of magnification of an object when viewed through a pin hole. If we place the wing of a fly in front of a pin whole and look at it, we will observe that this wing is considerably magnified. If, instead of looking at a close object such as a wing of a fly, we look at a distant object, we will find that the distant object appears considerably smaller than if it is viewed through the naked eye. This illusion again shows us how our eyes frequently fool us. In Fig. 5, MN is the mirror. The eye of the observer is at E, and C is an image of EA at E^1 A^1.

By the law of reflection of light the angle ANO equals angle ENO equals angle O^1NA^1. And ON equals O^1N, since the image appears as far behind the mirror as the object is in front. Hence by geometry and by the symmetry of the figure, the image E^1A^1 equals EA equals 2EO equals 2KN. Hence the portion of the image that is visible below the level of the eye is exactly twice the length of the portion of the mirror KN that is below the same level. In a similar manner it can be shown that that portion of the image that is visible above the level of the eyes is just twice KM. Hence the full image that is visible is A^1B^1, which is twice the height of the mirror MN.

(*Continued on page 671*)

Fig. 4 — When far away from a shaving mirror, the image is inverted and smaller.

As one approaches, the image appears the same size, still inverted.

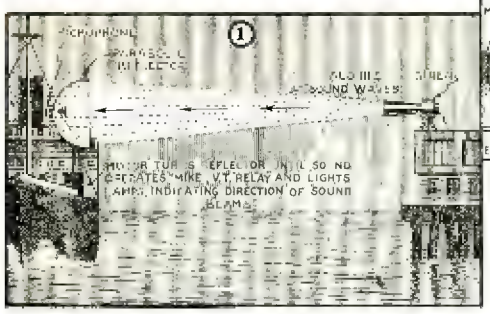
Still closer, the image of an object is larger and still inverted.

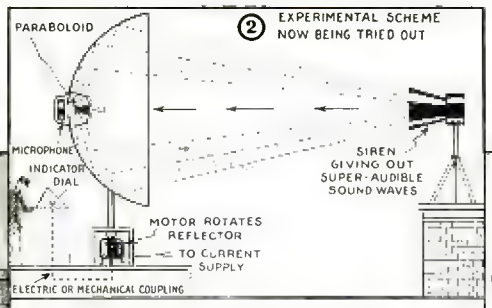
Finally a point is reached where there is no image at all.

At a distance of about 1½ feet from a mirror the image is erect and larger.

www.americanradiohistory.com

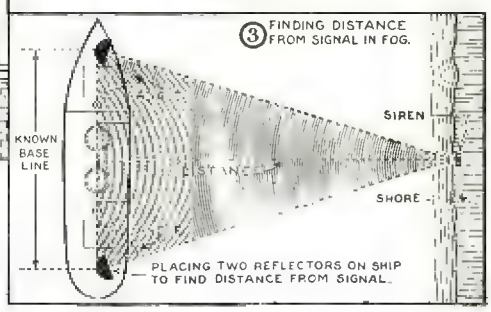
In the illustration shown below we see a ship being guided by the new sound compass. A motor turns the reflector until the sound operates the microphone, vacuum tube relay, and lights the lamp, indicating the direction of the sound beam. The audible sound waves are produced by means of a siren





Above we have an illustration showing an experimental idea which is now being tried out. In this case, a siren is used which gives out super-audible sound waves. The receiving portion of the device, however, is essentially the same as that used with the audible sound waves

The distance from the signal may be determined at night, or when a heavy fog obscures all, by the method shown in the illustration below. Two reflectors are placed aboard the ship and thus a triangle is plotted with known angles and base line. By bisecting the shore angle as shown, the distance from ship to land may be ascertained.



Sound Compass Conquers Fog

By H. H. DUNN

FOG, the bane of ships at sea, and of ferry-boat and other smaller traffic on our larger harbors, seems to be about to yield to a new device with which experiments have been conducted for nearly two months by one of the largest ferry companies operating on San Francisco Bay. In brief, the invention, which is known as the sound-compass, presents to the man at the wheel the same information as to the location, direction and distance of signals in fog, that the regular compass gives him regarding the general direction in which his ship is heading.

FOG COMPASS LONG SOUGHT

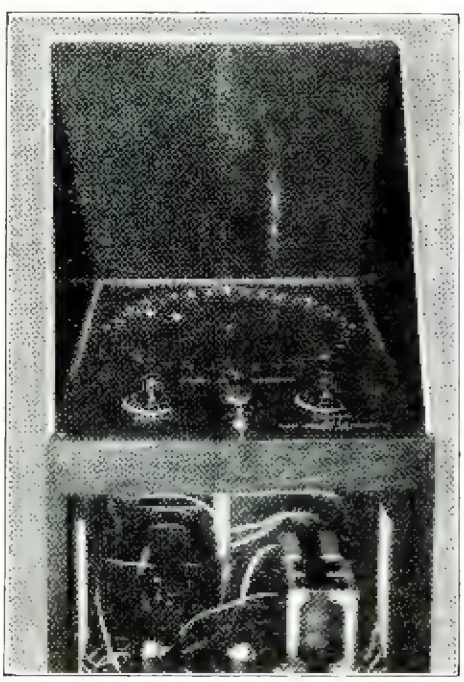
A number of attempts have been made for many years to produce a practical device which would aid navigation by locating the direction and distance from which sound is arriving. Results of the experiments carried on by the Key System Transit Company with the sound compass devised by Frank Rieber, of Berkeley, California, indicate that the problem has been solved.

The sound compass consists, essentially, of a sound-receiving device which is much more sensitive to sound arriving along its axis than it is to sound coming in from any oblique direction. This sound-receiving device, resembling a large reflector is mounted on a rotating shaft, maintained in continuous rotation by a motor in the base. Attached to the same shaft, either directly, or by means of gearing, or by an electrical drive, is a rotating indicator, moving at exactly the same speed as the receiver.

At the left we have a full length photo of the indicator section of the sound compass, with front panel removed, so that the mechanism by which the disk is rotated may be seen. The visible indicator consists of a small neon tube which glows brightly when actuated by an electric current. The sound receiving device converts the sounds received into electrical energy.

THE DIRECTION INDICATOR

This indicator consists, in its simplest form, of a bulb filled with a gas, such as



Above we have a view of the indicator on which the direction of signal is shown to the navigator. Aside from the control knobs, the visible features are a rotating disk, moving at the same speed as the receiver, shown in another photo, in an aperture whose perimeter is divided into the same number of points and degrees as the mariner's compass. The two light spots shown at the upper left of the disk are vacuum lamps, filled with neon gas, which flash when actuated by a slight electric current.

neon, which will glow brightly when actuated by an electric current. The sound-receiving device is arranged to convert the sounds received into electrical vibrations, which are amplified and then transmitted to the indicator, where they cause the lamp to flash at the same point of the compass at which the receiver picked up the sound.

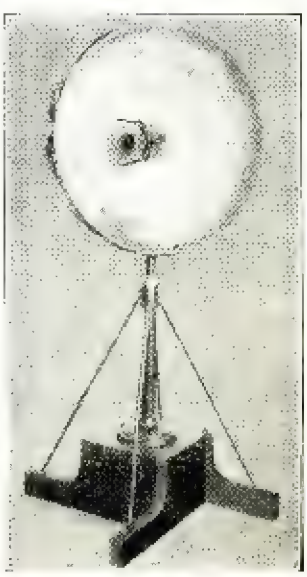
When a whistle, or siren, is blown at a distance from the receiver the sound receiving device, since it is constantly rotated, comes into a position where the microphone in its center is actuated by the vibrations received from the sound-producing device. The glow lamp on the rotating indicator then flashes, and, being in the same angular position as the receiver, the observer, by locating the flash, may read with certainty the bearing of the source of sound with respect to his ship. Since the sound pick-up device is rotated at a fairly rapid rate of speed, it picks up intermittently the source of sound, thus causing correspondingly repeated intermittent flashes on the indicator. As whistle signals are seldom less than one second in duration, the rate of rotation of the sound compass need be only two revolutions per second to give the observer two flashes of the direction of the source of sound.

In the receiving section of the sound compass, sound waves are concentrated by a parabolic reflector, and the vibratory energy arriving is directed towards a focal point in the center of the reflector. At this focal point, but projecting somewhat from it is a small solid paraboloid, with its focus on the same axis as the focus of the large reflector. In this way, sound waves arriving from a direction along the axis of the reflector are thrown toward its focal point, but, before reaching this point, strike again on the exterior surface of the small, solid, metal paraboloid, by which they are deflected backward toward a small orifice in the center of the reflector, wherein is a microphone.

The amplified sound through this microphone and amplifier, actuates electrical energy of sufficient intensity to make the light glow on the indicator in the pilothouse, during the period of the greatest intensity of the sound. By the ingenious arrangement

(*Continued on page* 668)

The receiving section of the sound compass may be seen in the photograph at the right. This portion of the apparatus consists of a reflector, about 3 feet in diameter, a small solid paraboloid and a microphone which is placed in the aperture in the back center of the reflector.



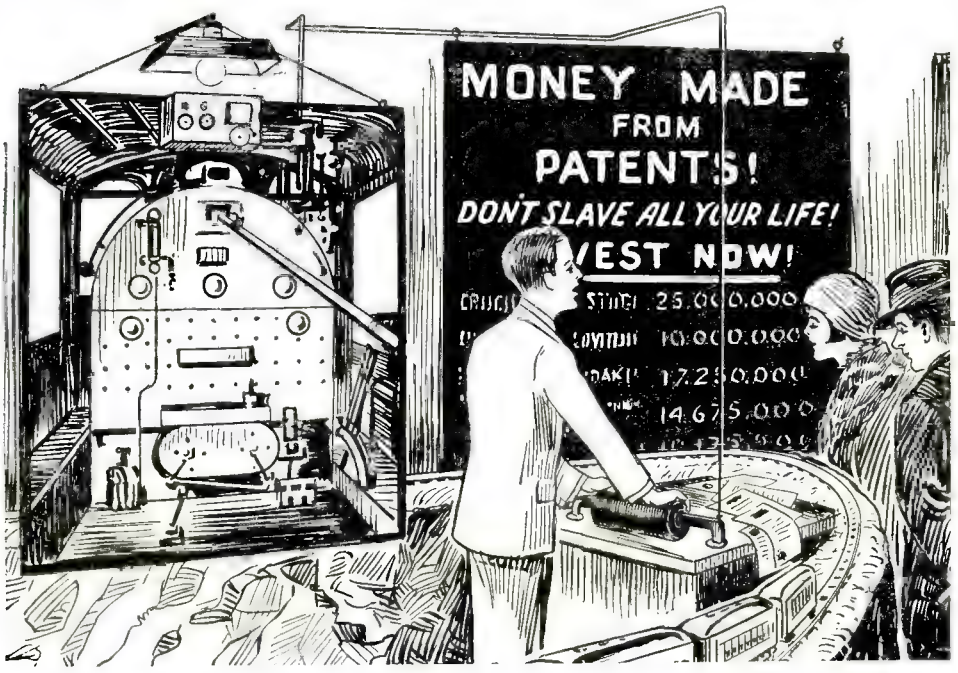
www.americanradiohistory.com

THE MODERN SHELL GAME

Manipulation of Stocks in Spurious Inventions Is a Source of Lucrative Income for the Promoters and Loss for the Investors

By BERYL DILL KNEEN

THE shell-and-pea artist of the circus lot and the side alley has seen his day, but it is still true that the "hand is quicker than the eye." Today, however, the shell may be the walls of an empty factory building, and it is the golden dividend that disappears, along with the original investment, between the agile fingers of the promoter.



Many train control systems have been developed and stock in the organizations is being sold in spite of the fact that some of them have not even been experimentally proven to give satisfactory service. The bill boards "bring home the bacon."

PERPETUAL MOTION

The swindling fraternity, finding themselves in a mechanical and scientific age, are more and more prone to center their efforts to make an easy living around a fraudulent machine or a distorted scientific theory. So plausible do they make many of their schemes that even the well-informed may sometimes be deceived. Consider the case of the police detectives who frequently worked with a Western Better Business Bureau to gather fraud evidence. Posing as interested prospects, they investigated the latest perpetual motion machine of a notorious swindler. They reported later to the Bureau's secretary, with evidence that completed the case for prosecution; but after one had left the office, the other leaned over the desk and said confidentially:

"You know, I think that fellow really has a pretty good machine."

It is extremely difficult to forecast, in this age of complex machine and business, the mechanical, scientific and commercial value of a new device or process. The best brains of the day are required to design, manufacture and sell an article at a profit. But the promoters of perpetual-motion machines or other devices depending upon "free energy" or upon newly discovered power sources, never reach the stage of manufacture. Trading upon the marvelous advances of science, and our general credulity, they periodically turn up with wonderful new devices and secret processes, "almost ready for the market."

In one western city a new variety of *perpetual-motion machine* appears at regular intervals, and ancient as the fraud is, it has rarely failed to produce good profits—to the charlatan who pockets the entire "investment." Not a few misguided experimenters claim to be so near to perpetual power that "one more revolution" of the device would solve the problem. Of late years, however, the "blue-sky" laws in many states have made public stock-selling practically impossible without a permit, and this is usually granted only after careful investigation. Even then, there is no absolute way of preventing dubious schemes for soliciting money, for all laws can be evaded.

ELECTRIC ENERGY FROM THE AIR?!

A favorite device which takes advantage of scientific efforts to unlock the power in the atom, is the so-called "free-energy" type of engine. Some such machines are said to be operated by electric energy drawn from the air. One inventor caused disconnected lights to glow weirdly, and even ran a motorboat by the same "free" energy, without visible power. Later he demonstrated an automobile equipped with this mysterious engine, which actually ran slowly on the level. But the invention was far from being "on the level," consisting merely of a storage battery concealed with unusual ingenuity; the lamp glowed because it was located in a high tension magnetic field carefully hidden, an experiment familiar to every electrical expert. Yet business men's names were obtained to "endorse" the inventor's claims, and he endorsed and cashed innumerable checks from less cautious investors which enabled him to live in pleasant prosperity while he developed new inventions, which, however, consisted of new methods of separating money from the unwary. (See Oct. issue for exposé on the perpetual motion type of machine.)

Although *all* perpetual motion machines are easily demonstrated to be impossible, because Nature is never frictionless and never gives back as much useful energy as is put into a mechanism, it is well known that there are still vast untapped sources of power.

TIDAL MOTORS—WATCH YOUR STEP

Thus for instance, there is a never-ending crop of promoters who have "solved" the difficult problem of harnessing the tides to provide power. Not long ago a promoter of such a prospective plant selling stock among the foreign-born, authorized his salesmen to tell investors that they could get their money back at any time by presenting the stock at their bank! Court orders stopped his operations, and his model never became a plant. No instances were reported of banks refunding the "investment." Some such tide machines work to a limited extent, but the heavy cost of equipment, necessity of storing the power, difficulty of anchoring and protecting against storms and heavy seas, etc., have so far baffled the best scientific and engineering brains. And it is well to keep in mind that when this and similar

(*Continued on page* 648)

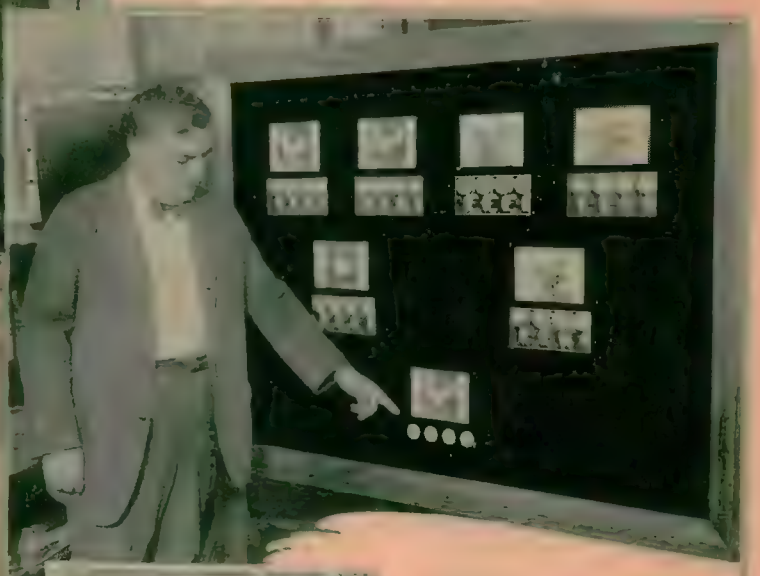
The "swindling fraternity" finds a very wonderful source of income from questionable perpetual motion machines which operate by concealed mechanisms like the one at the right. Generally the inventor does not care to do this unless he secures sufficient financial return for his "invention." The machine at the right actually operates, but it is not perpetual motion. The photograph shows Prof. Robert H. Smith of Massachusetts Technical Institute pointing to the mechanism. The secret of its motive power is not common knowledge.

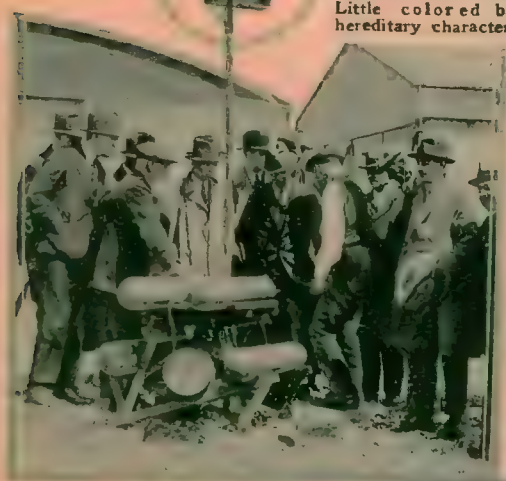
www.americanradiohistory.com

Science in the Camera's Eye

Alcoholism Detector; Machine for Working Out Hereditary Traits; Human Heart Beats Amplified One Hundred Thousand Million Times; Home-Made Ferryboat and Fog Horn—Are Among the Outstanding Novelties.

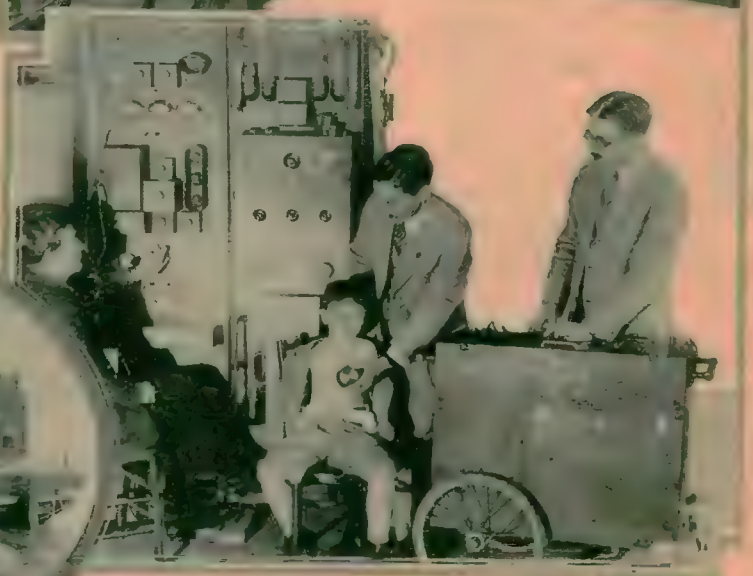
BREATH BETRAYS. Blowing through two bottles connected together indicates if person is intoxicated. The bottles contain sulphuric acid and potassium dichromate. Alcoholic breath produces chloroform.



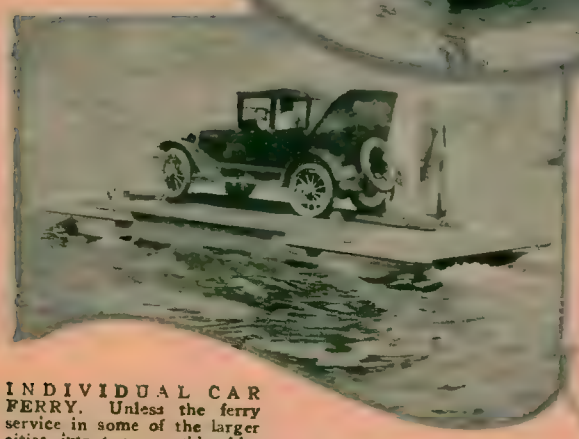


HEREDITARY TRAIT SOLVER. Little colored balls representing hereditary characteristics are put in the parent cups and by pressing a button transmitted traits are compiled.

FOG SIGNAL. Fog horns on opposite sides of the watercourse enable the pilot to determine which of the notes is louder and he can accordingly correct his course.



TELEPHONE AIDS SUBMARINE WORK. The photo here shows a charting barge platform used by the army engineers in New York harbor. Six leadsmen at their posts are in constant communication with the recording operator at the switchboard.



INDIVIDUAL CAR FERRY. Unless the ferry service in some of the larger cities improves considerably, in order to take care of the constantly increasing traffic conditions, we may soon find individual ferryboats such as the one indicated above. The ferry is steered by the automobile which also supplies the motive power for propulsion. The wheels act on rollers which transmit the movement to the propellers.

AMPLIFYING HUMAN HEART BEATS. At an annual meeting of delegates of the American Medical Association, human heart beats were amplified 100,000,000,000 times. The microphone was placed over the patient's heart and the current was then conducted to an amplifier. Loud-speakers produced a sufficient volume to carry the sound throughout the huge Washington auditorium.

BOYS BUILD OWN SPEED BOAT. In order to enable them to view the annual California crew race from the water, rather than from the river banks, James Tyson and Theron Howard, students of the University of California, built a speed boat propelled by a 151 cubic inch hydroplane engine. The boat, 10 feet long, develops surprising speed. Photo shows them in their boat.

The Metal Emperor

by A. Merritt

Author of "THE MOON POOL" "THE FACE IN THE ABYSS" *etc.*

And now before us stood a monstrous pillar, a geometric prodigy. Two great globes surmounted it. At left and right the incredible knobbed arms, fully fifty feet in length, writhed and twisted, flexing themselves in grotesque imitation of a boxer. At the end of each of the six arms the spheres were clustered thick and studded with the pyramids—dreadful parodies of the spiked gloves of those ancient gladiators who fought before the Caesars. . . .

CHAPTER V

"METAL WITH A BRAIN"

"YOU feel strong enough now to try it?" the relief in his voice betrayed the tension and anxiety which until now he had hidden so well; and hot shame burned me for my dread of again passing through the haunted vale.

"I certainly do. Drake—don't you agree?"

"Sure," he replied. "I'll look after Ruth ah—Miss Ventnor."

The glint of amusement in Ventnor's eyes faded abruptly; his face grew somber.

"Wait," he said. "I carried away some—some exhibits from the crevice where I heard the noises. Thornton."

"Exhibits?" I echoed, surprised.

"Put 'em where they'd be safe," he continued. "I've an idea—just the faintest idea that they're of more importance than our armored men. Far, far more importance. At any rate we must take them with us. Go with Ruth, you and Drake, and look at them. And bring them back with the pony. Then we'll make a start. A few minutes more probably won't make much difference but hurry."

He turned back to his vigil. I ordered Chiu-Ming to stay with him, and followed Ruth and Drake down the ruined stairway. At the bottom she came to me.

"Louis," she breathed, "I'm frightened. I'm so frightened that I'm afraid to tell Mart. He doesn't like them, either, these

www.americanradiohistory.com

things you're going to see. He likes them so little that he's afraid to let me know how little he does like them."

"But what are they?" asked Drake. "What's to fear about them?"

"See what you think," she led us slowly, almost reluctantly, toward the rear of the fortress. "They lay in a little heap at the mouth of the cleft where we heard the noises. Martin picked them up, and dropped them in a sack before we ran back through the hollow. They're grotesque, and they're almost cute, and they make me feel as though they were the tiniest tippy-tip of the claw of some incredibly huge cat just stealing around the corner—a terrible cat, a cat as big as a mountain!" she ended breathlessly.

We climbed through the crumbling masonry into a central, open court. Here, a clear spring bubbled up in a ruined and choked stone basin. Close to the ancient well was their pony, contentedly browsing in the thick grass that grew around it. From one of its hampers Ruth took a small bag.

"To carry—them," she said, and trembled.

We passed through what had once been a great door into another chamber, larger far than the one we had just left; and it was in better preservation, the ceiling unbroken, the light dim after the blazing sun of the court. Near its center she halted us. Before me ran a three-feet-wide ragged crack, splitting the floor and dropping down into black depths. Beyond was an expanse of smooth flagging almost clear of debris.

"There they are," she said. In her eyes was a curious fear, puzzled fascination as well. She was pointing at what seemed to be a raised and patterned circle on the dust-covered floor. It was about a foot in width and gleamed with a pale, metallic bluish lustre as though recently polished.

"Martin put them there so——" she hesitated, then added, amazingly, "so they couldn't run away. They can't jump the crack."

Wondering, I stepped over the crevice, Drake beside me. Leaning over the ring, I observed that it was not continuous. The circle was made up of sharply edged cubes about an inch in height, separated from each other with mathematical exactness by an inch of space. I counted them—there were nineteen. Within this circle was a second ring of pyramidal shaped objects—tetrahedrons—sharply edged and of similar base dimensions, that is one inch. They were not upright but on their sides, with tips pointing to six spheres clustered like a conventionalized five-petaled primrose, in the exact centre.

(*Continued on page 630*)

Synopsis

Dr. Louis Thornton is traveling through Tibet with his Chinese servant-cook, Chiu Ming and two ponies that carried the impedimenta. They came upon a white man who introduces himself as Richard Keene Drake. Drake's father had been very friendly with Thornton. The three decide to carry on. One evening, they see the rays of the setting sun broken up in a most spectacular display and the aurora which follows sucked down as if by a purposeful hand. Shortly thereafter they discover a gigantic foot-print in the fresh meadows, so heavy that it imbedded flowers in a smooth matrix which it made of the crushed rock and rubble.

Traveling through a veritable pit of despair from which they scarcely escape with their lives, they come upon Martin Ventnor, a geologist, and Ruth, his daughter. The latter are guarding themselves against hundreds of soldiers who belong to an age at least twenty centuries back. They speak in an archaic Persian language which is fairly well understood by Ventnor. It would be hopeless for the party to try to attack these ancients, so they decide to slip out of their fortress.

www.americanradiohistory.com

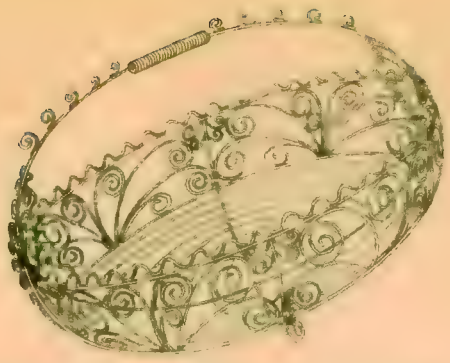
Wirekraft

Last Group

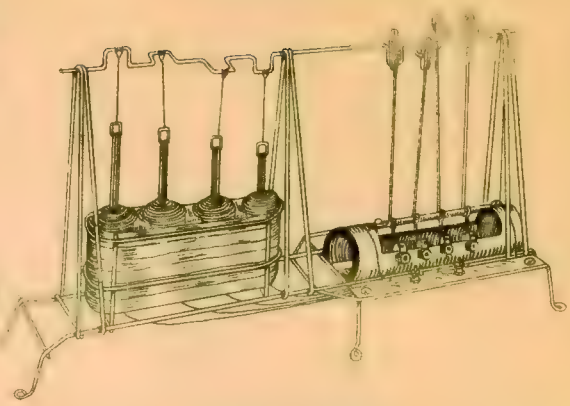
Keen Competition As

The lantern which won the first prize indicated above has a hexagonal shape, the post of which is made entirely of wire while the fittings are likewise made of the same material. It is fitted with one bulb at the top, access to which can be obtained by removing the pin from the hinges. There are six amber colored glass panels which diffuse the light.

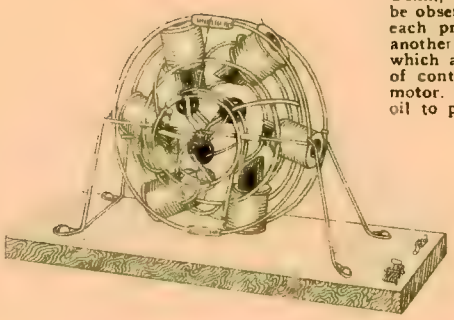
First prize—$100.00 awarded to E. F. Storz of Detroit, Mich. for the Wirekraft lamp illustrated in the drawing at the left.

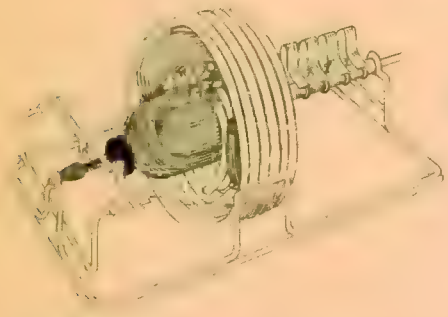


Second prize—$50.00 was awarded to the artistic fruit basket made by Selmer Wick, of Superior, Wis., and illustrated above. With extreme care Mr. Wick curled wire into the various spirals and after matching them exactly, soldered them in place on a wire form. The article when completed was painted with metallic gold and silver in a striking combination. Made of relatively heavy material, the article is very serviceable.

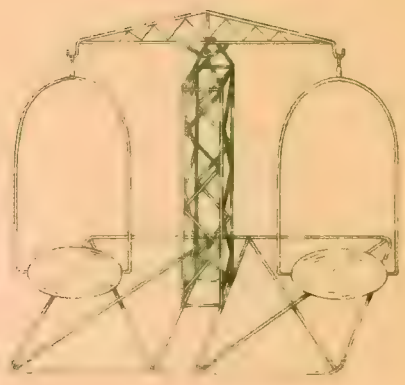


Third prize—$25.00, was awarded to Dale Scaggs, of Clinton, Tenn., for quite a powerful and unique solenoid motor. It will be observed from the drawing above that there are four solenoids, each progressively acting on their cores. In addition, there is another crankshaft integral with the one driven by the solenoids which actuates four levers, communicating their strokes to a set of contacts. These contacts serve as the commutators for the motor. The make and break occurs in a fiber tube filled with oil to prevent sparking. This is truly a remarkable and powerful motor.



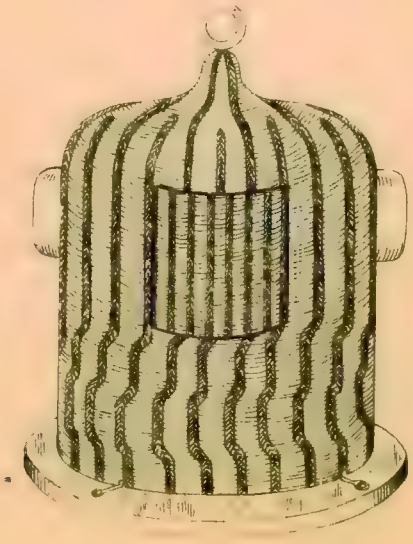


Tenth prize—$2.00, was awarded to John Keul, Jr. of Pittsburgh, Pa., for the impulse electric motor shown above. This article was originally made to operate on a 110 volt circuit. The three balls of the armature rotate around at a great speed and close observation will show the six brushes which close the circuit to the respective coils through a six-pointed commutator.



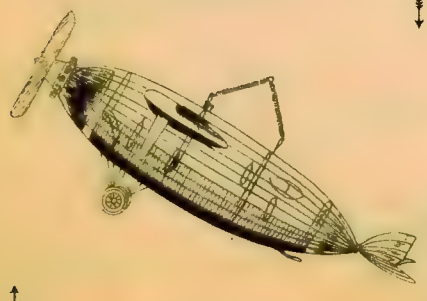
Sixth prize—$10.00. Here is a rotary converter made entirely of wire and built by Frank N. Godsey, Jr. of Beaumont, Tex., which is quite an ingenious piece of work. The stand, stator and armature are made of iron wire and copper wire is wound upon these pieces. With a source of 24 volt potential from a direct circuit, the rotary converter develops 18 volts, 4 phase, 40 to 60 cycle current.

Seventh prize—$7.50, was won by Maynard Clark, of Arcadia, Calif. This serviceable balance to which the seventh prize was awarded, has pans made of a wire helix. The weights themselves are made by curling up larger or smaller pieces of wire to the shape of the usual apothecary weights.



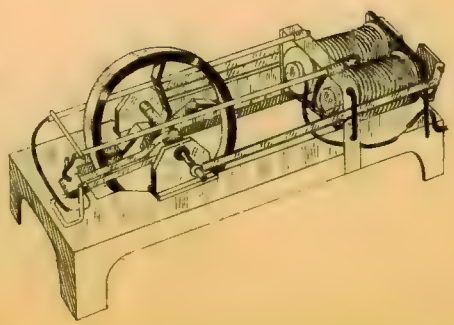
Fifth prize—$15.00, awarded to Louis Kopzik of Baltimore, Md., for his Lucky Lindbergh bird cage. The bird cage is made in the form of an airplane with two short wings on either side and a motor housing up forward in which two incandescent lamps are to be found. As the bird hops on the perch, circuit to either one or the other lamp is closed, causing the lamps to flash in harmony with the swinging of the perch.

Eighth prize—$5.00, was awarded to Kenneth Bird, of Pocatello, Idaho, for the motor indicated below. It took Mr. Bird about fifty hours to make this motor, and the only tools which he used were a file, a pair of pliers and a soldering iron. The motor is smoothly finished and is interesting to watch as it turns at a good speed from a 12 volt source of supply.



Batteries for the bulbs are concealed in the wings of the airplane above.

Fourth prize—$20.00, was awarded to Michael J. Thelen, of Chicago, Ill., for the love bird cage illustrated above. It will be observed that the wires in this cage are rather close together. There is a purpose for this because love birds have been known to strangle themselves between bars of cages when the bars are further apart. The base of the cage is of wood. The wires are fairly knitted together and two shades are employed to enhance artistic effect.

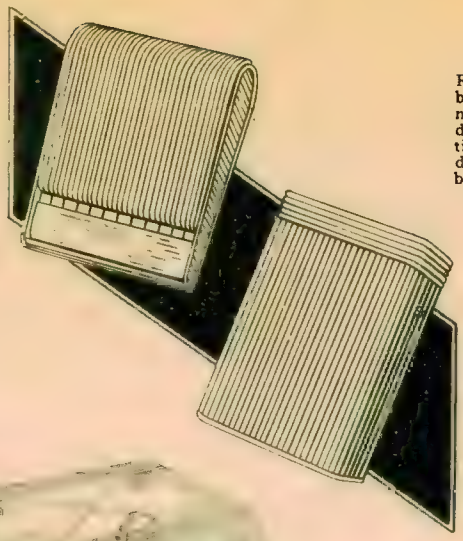


www.americanradiohistory.com

Awards

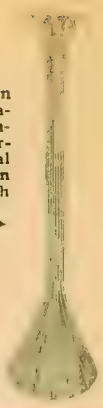
Of Prizes

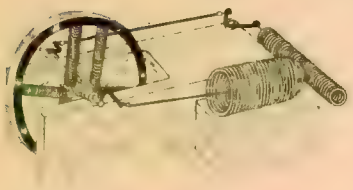
Contest Terminates



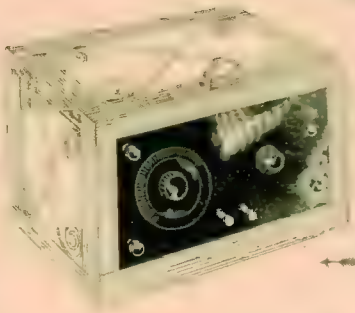
Fourteenth prize—$2.00, is issued to E. J. Raible, of Louisville, Ky., for the two match boxes here shown, made entirely of wire as are all the other Wirekraft Contest entries. One of these will hold a book of paper matches and the other holds the regulation wooden match.

Fifteenth prize—$2.00, was won by Wallace Page, of Chattanooga, Tenn., for the vase indicated at the right. This article is intended to hold floral decorations, or a test tube can be slid into the holder and fresh cut flowers can be inserted.



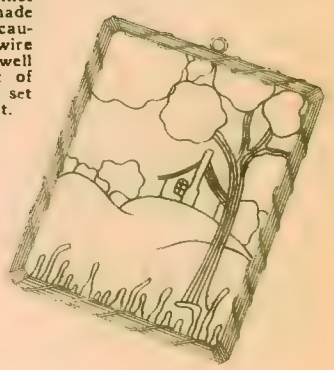


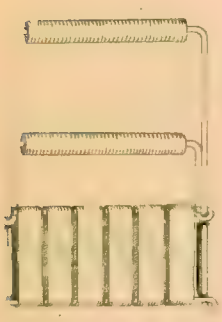
Ninth prize—$3.50, was won by Carlton C. Mills, of New York City, for his model of a very simple steam motor. This motor will operate on but a slight amount of power, the valve motion being transmitted through a rightangle piece of wire.



Eleventh prize — $2.00, was awarded to the radio cabinet indicated at the left and made by Charles Mangers, of Secaucus, N. J. The angle wire corners hold the panel as well as serve as the front part of the cabinet. A one tube set was enclosed in the outfit.

Sixteenth prize—$2.00 was won by B. W. Showalter, of Davenport, Neb., for the picture and frame made entirely of bent copper wire, enamel covered. Against a light background it presents a pleasing appearance.





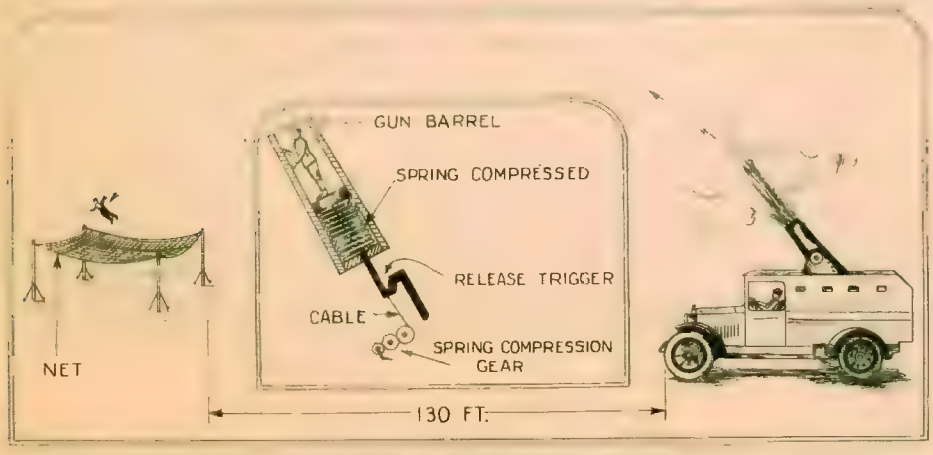
Twelfth prize—$2.00. The illustration at the left snows a hand exerciser which won this prize award for Gilbert Swift, of Brooklyn, N. Y. Made of wire with two handles and rubber as the tension, this exerciser strengthens the muscles of the hand and forearm by grasping the two handles and closing the fist. The article is of simple construction as the diagram indicates.

Thirteenth prize—$2.00 was won by Ben V. Kitchel, of San Antonio, Texas. He made the hot pie pan or plate lifter indicated at the right. Here we see a pair of tongs which ride under the plate supported from the bottom, and the circular pieces surrounding serve to prevent it from sliding off.

And thus endeth the Wirekraft Contest.

Man Shot from Gun

Powder and Springs Hurl Human Being 130 Feet Into Net



The above diagram illustrates the manner in which the human bullet is fired from an automobile gun carriage into a net 130 ft. away, and also shows one of the systems for producing the power for propulsion. The smoke is a blind.

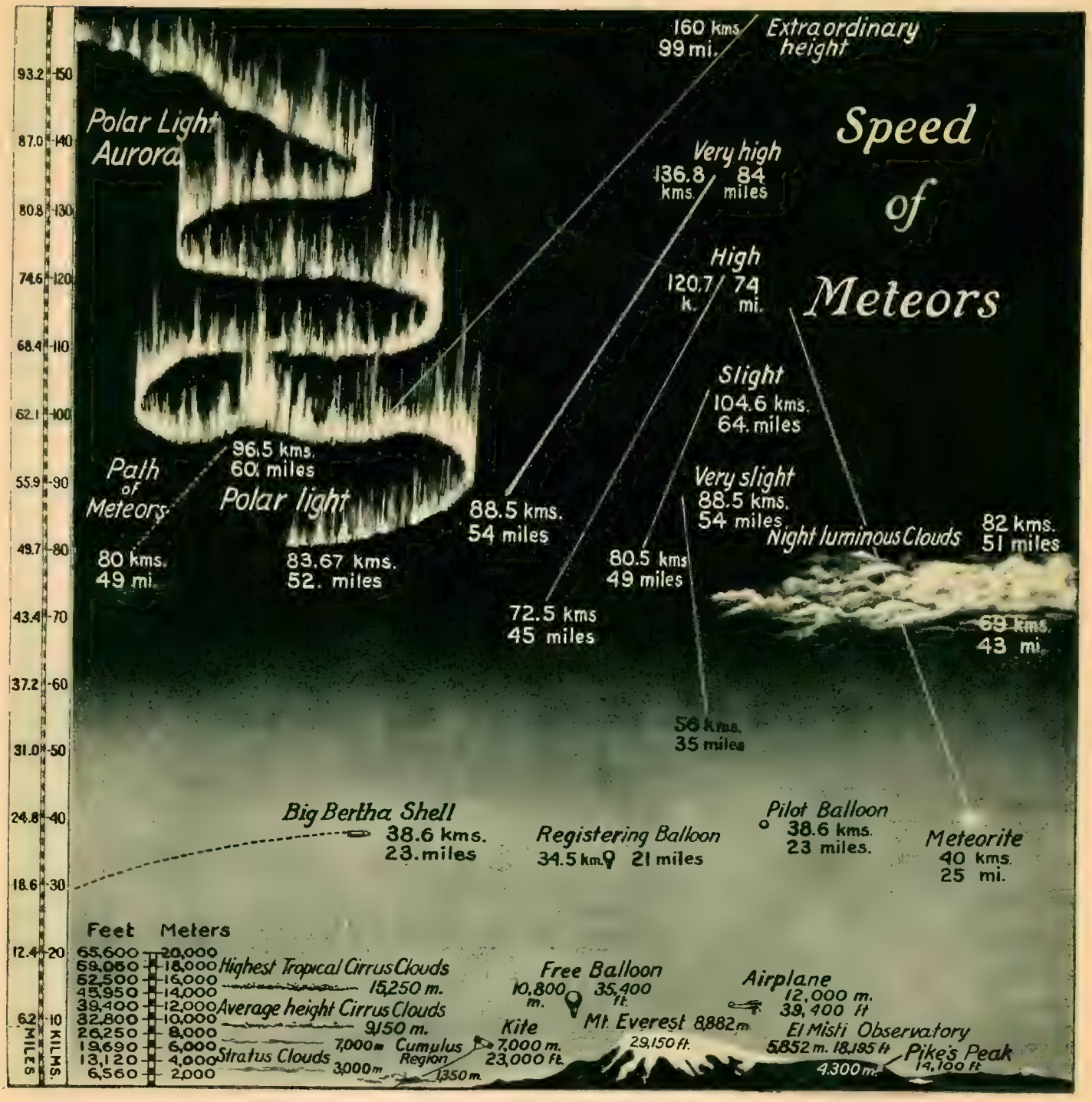
AT Milan, Italy, Ugo Zacchini, of Turin, has developed a spectacular effect with the aid of his brother, who invented the device. The system is a monstrous mortar, especially mounted on an automobile gun carriage. Mr. Zacchini gets into the gun and then simultaneously with a loud report, he comes flying out of the mouth to land in a net a distance of 130 feet away. Statements have been made that a real charge of powder is employed to hurl him through the air. It is questionable that powder is used because of the sudden release of gases, which, to be controlled, would have to pass through very small openings, as in the powder type catapults described in the August issue. The smoke is used more as a blind to cause a greater thrill, while springs are employed to produce the propulsive force. The diagram above illustrates how one of these powerful helical springs could be used in such a manner. The cable and gear produce the spring compression force. A trigger holds the spring in this position until the "human bullet" is released. It is obvious that uniformity of propulsion must ever be present, otherwise the "bullet" might miss the target.

Actual photograph of man being shot from a gun, showing him just as he is leaving the mouth, his body being partly obscured by the smoke. This is a remarkable photographic shot.

www.americanradiohistory.com

A Yardstick of the Sky

Simple Chart Which Shows Height of Meteors, Clouds and Airplane Flights



The above illustration shows the limits of the upper atmosphere. The greatest height at which meteorites appear is about 100 miles

The luminous clouds seen at night usually sweep along at a height of 43 to 51 miles above the surface of the earth.

LAST November was distinguished by a specially large number of falling meteors. And so for instance in Bremen, Germany, the place where they fell, there was an enormous area which the police at once protected from intrusion to make possible scientific investigation by the Meteorologic Station of the city of Bremen. Also in the vicinity of Berne and in Vogelsberg, the falling of meteors was observed. The appearance on the Vogelsberg showed bright greenish light and they fell almost vertically leaving behind them a long tail of sparks. The heights at which the path of these satellites began to bend down towards the earth was sometimes quite enormous and their velocity of flight was proportionately great.

In this regard it is interesting to bring before the eyes the height in which the atmospheric effect was to be seen and how far human estimation of these instances could be carried. The greatest height at which meteorites make their appearance and therefore their incandescence as observed is about 160 kilometers (about 100 miles). This is a distance to equal which we would have to put the highest mountain in the world (Mt. Everest) 18 times over and over upon itself; the smallest distance is 40 kilometers (about 25 miles) or about 4½ times as high as Mt. Everest. At the limit of the atmosphere of the earth at the height of 69 to 82 kilometers (43 to 51 miles) the luminous clouds seen at night sweep along, which are supposed to consist of very fine dust which has been showered from volcanic eruptions. Above them the auroral light plays. How small compared to these are the heights which man or the creations of his art can reach. The Frenchman Callizo, in 1924, flew to a reputed height of 12,000 m. (40,000 feet) with an aeroplane: the German meteorologists Berson and Suring in 1901 reached the height of 10,800 meters (35,000 feet) in an untethered balloon. A recording balloon which has only had to carry registering instruments and a pilot balloon have gone much higher, 3½ or nearly 4 times as high. Even the projectile of "Big Bertha," which bombarded Paris in the World War, reached this considerable altitude.—*Die Umschau*

www.americanradiohistory.com

Tropical lilies make this beautiful scene in Tower Growth Park in St. Louis, Mo. This variety is the Victoria Regia, named after the English Queen, and its huge pads will support the weight of a person; note girl standing on lily pad. The lily likes only warm climates and has to be replanted every summer. The beautiful blossoms are huge and white in color.

The Astrology Humbug

By JOSEPH H. KRAUS

DOES NOT BELIEVE IN ASTROLOGY

Editor, SCIENCE & INVENTION:

I heartily agree with Elmer C. La Lone, writing in the September issue of SCIENCE & INVENTION that astrology should not exist in a truly civilized and educated nation of today. Such beliefs indeed date back to the times of the very early philosophers of Egypt, Persia, Arabia, and Greece.

We should not however brand every one who has believed in astrology as an unscientific thinker or scientist for if we did we would undoubtedly say it of Kepler and Francis Bacon who were strong adherents of astrology. The former discovered the laws governing the motion of the planets. To some of the early astrologers we are indebted for many of our astronomical facts.

To correctly forecast one life or foresee events is something that man has always wanted to do and so it is no wonder that those of the poor misguided public who know little or nothing about astronomy should allow themselves to be "hoodwinked" by so called astrologers. We find in the history of every nation which we are able to trace the idea at some time or other that the stars controlled the destinies of men. However the only method for the correction of error is the truth and so a fuller understanding of astronomy and its principles would tend to destroy the belief, I believe, in such "bunk." I can without any knowledge of the supposed "Elements of Astrology" sit down and make a lot of foolish guesses and surmises as to some man's future life just because he is born during a certain natural phenomena, label it a horoscope and say that I am an astrologer. If there is any science in that I fail to see it

D. H. ROGERS
Des Moines, Iowa.

(One must never lose sight of the fact that many of our ancient astronomers believed in astrology only insofar as this was a means toward an end and the end in this particular case was a lucrative, financial income from this subject. Many of us would today become astrologers if we knew that it brought an annuity for life. Why is it that modern astronomers are not astrologers? Can it be that they know less than our ancient astronomers, or is it because they know more? We are inclined to the latter belief.—EDITOR.)

$6,000.00

For Proofs of Astrology

SCIENCE AND INVENTION Magazine holds that there is nothing scientific in Astrology, that Astrology is not a science and that statements made by astrologers unless very general cannot be entertained seriously.

Accordingly, this publication has decided to award an Astrology Prize for $6,000 for the following:

$5,000 will be paid to the astrologer or forecaster who will foretell three major events of such a nature that he will have no control over the outcome of the same. He must describe in advance each event in detail, giving the location and result or the casualties if the event is an accident.

$1,000 will be paid to the astrologer or forecaster who will produce three accurate, detailed and perfect horoscopes, free of contradictions on the lives of three people whose initials will be given him when he requests the same and the birth dates and place of birth will also be supplied by this office.

This contest closed October 1st, 1927, and further announcements will be made.

Address all entries to Editor, Astrology, care of SCIENCE AND INVENTION Magazine, 230 Fifth Avenue, New York, N. Y.

ASTROLOGICAL WEATHER FORECASTING

In July the president of the Astrologers' Guild, Sidney K. Bennett, proposed to the "New York Times" to carry on long distance weather forecasting, and finally submitted predictions for the month of August which were to be published in the "Times" alongside of the record of the actual weather experience. This record was to be made for New York. Analyzing the prediction we find that the great characteristic of the August weather was entirely missed. The month of August of this year was the coldest one on record, but if this was known by the stars they did not pass on the information to the astrologers. The "Times" in making most generous allowances for those predictions which were half right, indicates that the president of the Astrologers' Guild was correct in six out of a possible thirty-one times. Either this was a remarkable run of bad luck in guessing, or else it indicated very poor ability to read planetary configurations. We surely would not hold that Mr. Bennett, as president of the Astrologers' Guild, made many grievous errors in his calculations or interpretations.

The editor of the Times further writes: "Everybody knows so much more about the weather than anybody else that it is a subject which fairly invites credulity and superstition. The predictions of the Weather Bureau are often wrong, though its percentage of accuracy is really high, so that people are all the time looking about for weather prophets who have mysterious credentials. This gives a chance for those who know all about 'planetary vibrations in the atmosphere,' and who are able to run down 'the electricity generated by Uranus when it is near the Equator.' If you add to this a lot of knowledge about Arcturus, the bands of Orion and the sweet influences of the Pleiades, you have evidently got precisely the right basis for forecasting the weather a month ahead

"So the Astrologers' Guild thought when its President offered to test its predictions by the actual facts throughout the month of August. Whatever else they prove, they show that this particular astrologer was one of the most unlucky

(*Continued on page 669*)

MODEL DEPARTMENT

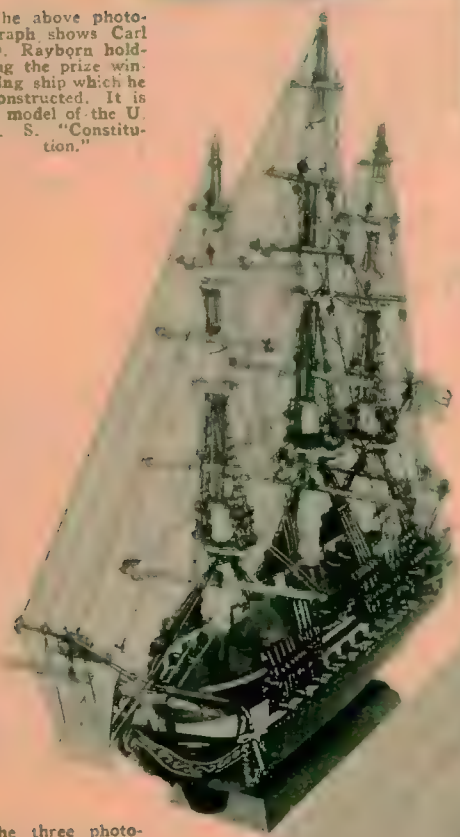
Model of "Constitution" Wins Trophy

Carl D. Rayborn, Sixteen-Year-Old Philadelphia Youth, is the Builder

The above photograph shows Carl D. Rayborn holding the prize winning ship which he constructed. It is a model of the U. S. S. "Constitution."

Here is a side view of "Old Ironsides" alongside of the Science and Invention model trophy. Any type of model can be entered in this trophy contest and we refer our readers now to the box copy in the center of the accompanying page. The model above illustrated is made entirely of wood and strings, paint being applied to produce artistic effect. The cannon are of wood.

The Science and Invention trophy cup 18½ inches high is shown above. One of these cups is monthly awarded to the best model entered in the Model Contest. Contestant need but merely ship his model to the Model Editor—we do the rest.



The three photographs here show different views of the prize-winning ship model "Old Ironsides." This ship, one of the most historic in the history of the United States, is an everlasting source of interest. The original vessel was launched in 1797 and after service in the war with Tripoli, fought a famous battle with the Guerriere while in command of Isaac Hull in August, 1812. The vessel was a 44 gun frigate.

An airplane view of the prize-winning model

Engines, airplanes, ships, etc., can be entered in Model Contest. Enter your model now.

Building a Model of the U. S. Brig of War "Truxton"

By WILLIAM A. CROSBY

PART IV

(*Continued from the October issue: full working drawing on next page*)

THE lower masts of the proper length, being planed out and sandpapered, should have their upper ends fitted with the cheek pieces or bibbs with the trestle-trees and cross trees laid in and with the top itself on top. All should be made of light wood, but the top may be made of very heavy cardboard and the whole thing glued together. Remember to punch the holes in the top for the ropes and also don't forget the lubber hole, 32. The drawings will give you full data on the top and its assembly. The masts, by the way, will also have iron hoops on them exactly like the bowsprit, but they may be a little further apart.

Down on each side of the mast to the chains will come ropes known as the shrouds. These hold the lower masts and also much of the upper masts in a vertical position when the ship is rolling heavily. They also serve as ladders for the crew to get aloft, these ladders or cross pieces of rope being called the ratlines. There are twelve main shrouds on each lower mast, six on each side.

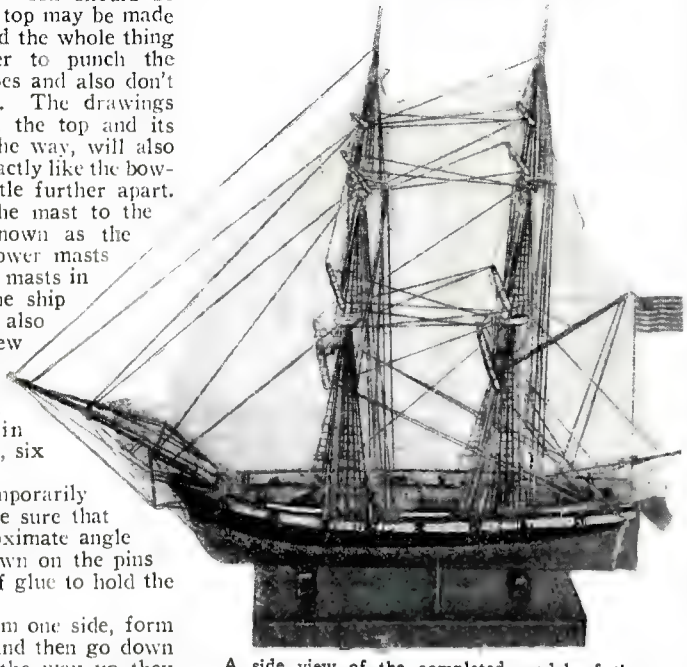
The masts should be temporarily guyed in place until you are sure that you have them at the approximate angle and then drive the ends down on the pins in the keel, using a touch of glue to hold the masts securely.

The shrouds come up from one side, form a loop over the mast head and then go down the same side again. On the way up they pass through the lubber's hole on each side of the mast and this acts as their support. In reality the way to do this is to make the complete set, six for each side, and, after cutting the line long enough, make a loop right in the middle which will be just a little larger around than the mast, 33. This loop should not be tied in but made by wrapping a little black thread around the neck of the loop in the form of a seizing.

The foremost shrouds go on first, say the ones which run down to the right hand side of the ship (starboard), and then comes the pair which run down to the other (port) side, the two furthest forward on this side. Then comes the next pair on the starboard side and then back to port and so on until all are in place. The seizing on the loops should present an even appearance under the cross trees.

Each lower end of a shroud is brought down and through one of the eyes in the channels, tied once, tautened up and then tied again about half an inch above the first knot. This makes it have the appearance of the dead eyes of a regular ship and saves a considerable amount of time and labor. Each shroud should be brought down to its respective eye so that all are in proper order.

When the shrouds are all in place, then comes the head stay, which runs down to the bowsprit just aft of the cap. Remember that the head stays from the fore and main mast are arranged double so that the two pieces run side by side. This is done by measuring the length required and then doubling it and seizing a loop in the center. This loop goes over the top of the masts and, in the case of the main mast, it leads down to the deck just forward and on each side of the hatchway. This stay is seized together at a point just astern of the fore mast and, of course, at the top where the loop is formed.



A side view of the completed model of the U. S. Brig of War "Truxton," made in accordance with the details given in this and previous articles.

Rules for Model Contest

1. A handsome trophy cup engraved with your name, will be awarded as the prize for the best model submitted during the month. The decision of the judges will be final and will be based upon, A—novelty of construction; B—workmanship; C—operating efficiency of the model as related to the efficiency of the device which the model simulates, and D—the care exercised in design and in submitting to us sketches and other details covering the model.
2. Models of all kinds may be entered. They may be working models or not, according to the subject that is being handled.
3. Models may be made of any available material, preferably something that is cheap and easily obtainable.
4. Models must be submitted in all cases. Good photographs are also highly desirable and where the maker does not desire the model to be taken apart, legible drawings with all dimensions covering parts that are not accessible must be submitted.
5. Models should be securely crated and protected against damage in shipment and sent to us by parcel post, express or freight prepaid. Models will be returned when requested.
6. Models for entry in any particular contest must reach this office on or before the 25th of the third month preceding date of publication. For instance, models for the January contest must reach us on or before the 25th of October.
7. Address all entries to Editor Model Department, c/o Science and Invention Magazine, 230 Fifth Ave., New York City.

The fore stay, as stated before, goes to the bowsprit just aft of the cap and it, too, is doubled with the loop arrangement at the top as in the other. Where one end comes down, it passes under the bowsprit and is then seized up to the other part, making a nice loop. The other stay is led down in exactly the same way, but is led around the bowsprit in the opposite direction with the seizing parallel to that of the first stay.

These two sets of stays should be tight and should take up all the slack that is left in the shrouds, if there is any, but be sure that it does not get too tight thus pulling the mast out of position.

The two topmasts should now be put into position. They are both alike in construction, but the one on the main mast is slightly longer than the one on the fore. These are secured in position by putting a pin up through the fore and main tops so that it will take the foot of the topmast and hold it securely in place. Put a little glue on the pin before it is pushed home, so that it cannot work loose.

These topmasts, of course, go on the forward side of the lower masts and the angle from the perpendicular is exactly the same. Do not allow these topmasts to slant either forward or aft, but keep them in line with the lower masts.

The extreme upper ends of the lower masts are, of course a few inches above the actual tops and this upper end is strapped to the topmasts so that it is held securely. You may use the mahogany cardboard for the strap or you may use wood, glued and pinned in place.

Again we must put shrouds on, this time from the tops to the topmast tops. Of course the upper top or crosstree must go in place first and this is made exactly like the lower tops, except that it is slightly smaller and in skeleton form. The shrouds are made by looping and placing over the topmast heads just like the lower shrouds, but the lower ends of these shrouds, instead of going way down to the deck, come down to the lower tops only, where they are set up through small eyes, made of wire. These wire eyes are placed along the edges of the lower tops, but instead of the wire stopping at the under side of the tops, it is carried down and through the lower shrouds to a point about one inch below the lower tops.

From these eyes to the point where they meet the mast, they form a sort of converging point and are known as the futtock shrouds. They may be secured by wrapping around the mast, but the better way is to make two little eyes which are placed in the mast at the right point and the wire futtock shrouds are secured to these eyes. This will make a far neater arrangement.

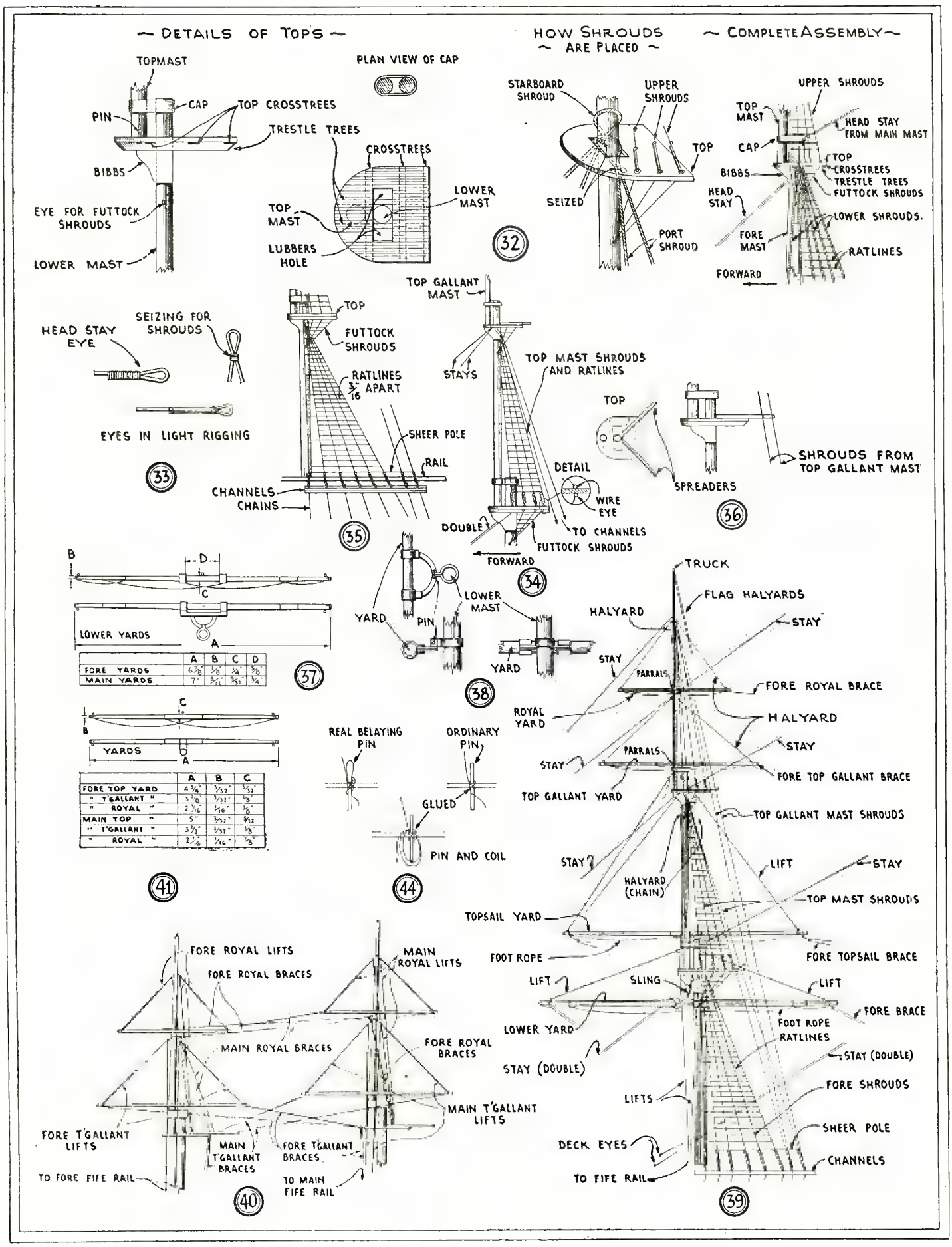
In addition to these regular shrouds, coming from the topmast top, there will be two

(*Continued on page 664*)

www.americanradiohistory.com

Working Details for Building the Brig "Truxton"

(Continued from preceding page)



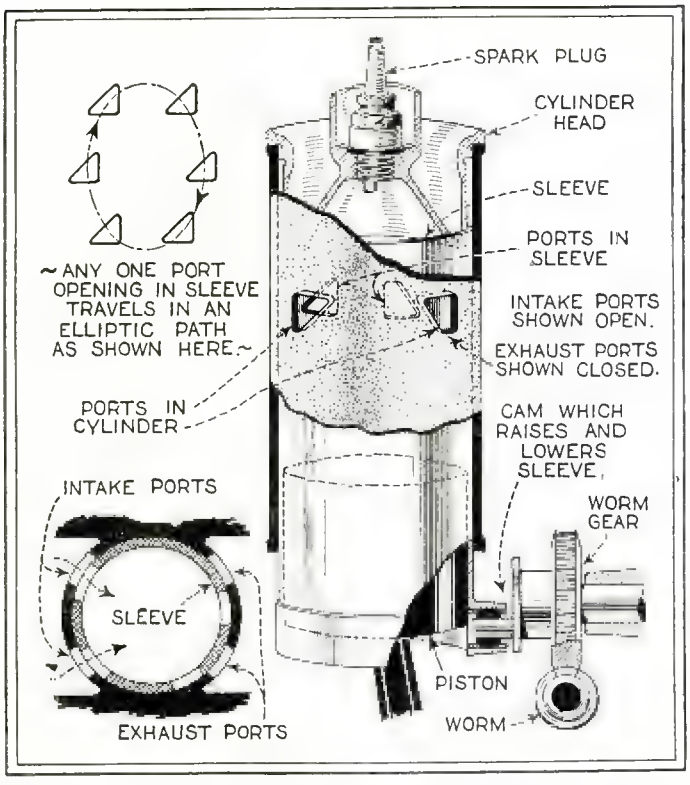
The details of construction of the rigging and masts of the Brig "Truxton" are given in the above drawing. Note details of tops.

The placement of the shrouds, the complete assembly and various minute details appear in this illustration and should make everything clear.

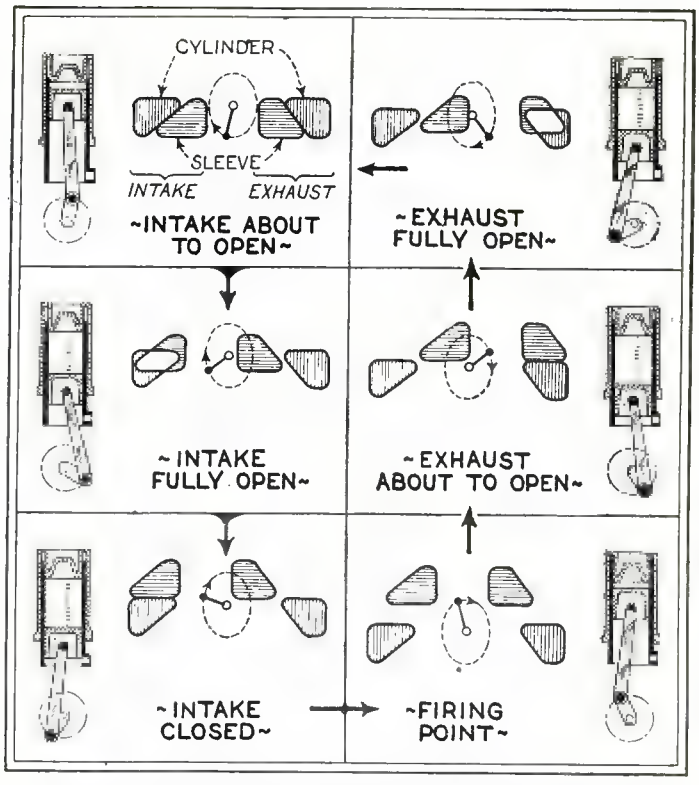
www.americanradiohistory.com

New Single Sleeve Auto Engine

Remarkable New Automobile Engine Has But One Sliding Sleeve Instead of the Usual Valves



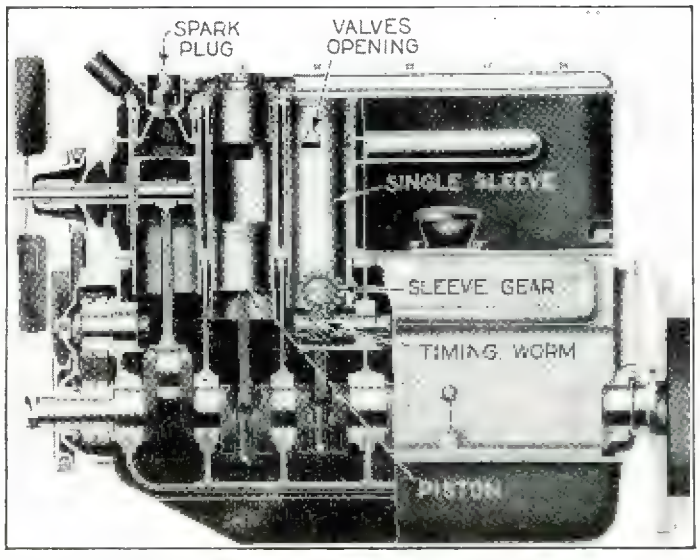
The diagram above will give one a very good idea as to how the newest American automobile engine, with its single sliding sleeve valve, operates. A thin iron sleeve containing valve ports is oscillated up and down inside the cylinder, so that the ports open and close in a regular cycle, the same as in the regular poppet valve engines now in use. The movement of the sleeve is shown by the diagram in the upper left hand corner.



The chart above will help you to understand how the newest sensation in automobile circles, the single sleeve design, manages to do all the work accomplished by the well-known poppet valve engines; and also that done by the more complicated double sleeve Knight motors. By following the arrows down the left-hand column, across to the right hand column, and thence upward, the cycle of port opening and closing will be seen.

PRACTICALLY every make of automobile engine in use in this country today, with the exception of a few makes of cars fitted with the Knight double sleeve motor, utilize poppet valves. It is the claim of the sponsors of the double sleeve motor that it can be operated for a far greater length of time than the poppet valve type, without having to grind valves or clean carbon out of the engine. No doubt this claim is reasonably correct. The makers of the double sleeve motor have also stated that their engine improves with age as the parts become better worn in and smooth running; they also show performance curves for operation over periods as great as one hundred thousand miles, wherein the sleeve valve engine curve is a gradually ascending one, with regard to engine efficiency and general performance. The performance curve for a poppet valve engine is shown as a rapidly decreasing one, especially after the forty thousand mile mark has been reached.

Aside from the greater freedom from carbon, which is greatly reduced in any case by the use of ethyl gas or similar treated fuels, there is one very important factor which is inherent in sleeve valve engines as compared to the poppet valve type. In a few words what happens is this. If you take a poppet valve engine, which is in good shape, and speed up this engine to its maximum speed and let us say, somewhat higher; tests will show that at certain high speeds the poppet valves will be neither opening nor closing, but practically standing still halfway between the fully opened and fully closed positions. No engine can perform perfectly unless the valve parts open and close properly. As will be at once evident, such a condition cannot happen in the sleeve engine, whether it uses two sleeves as in the Knight motor, or one sleeve as in the Continental design.



This semi-sectional view of the new single sleeve, motor car engine shows the shaft containing the timing worms, which co-act with the sleeve gear and cam shown in the drawing above, which action oscillates the valve sleeve up and down and crosswise but following an elliptical path.—Photo courtesy of Continental Motors Corp.

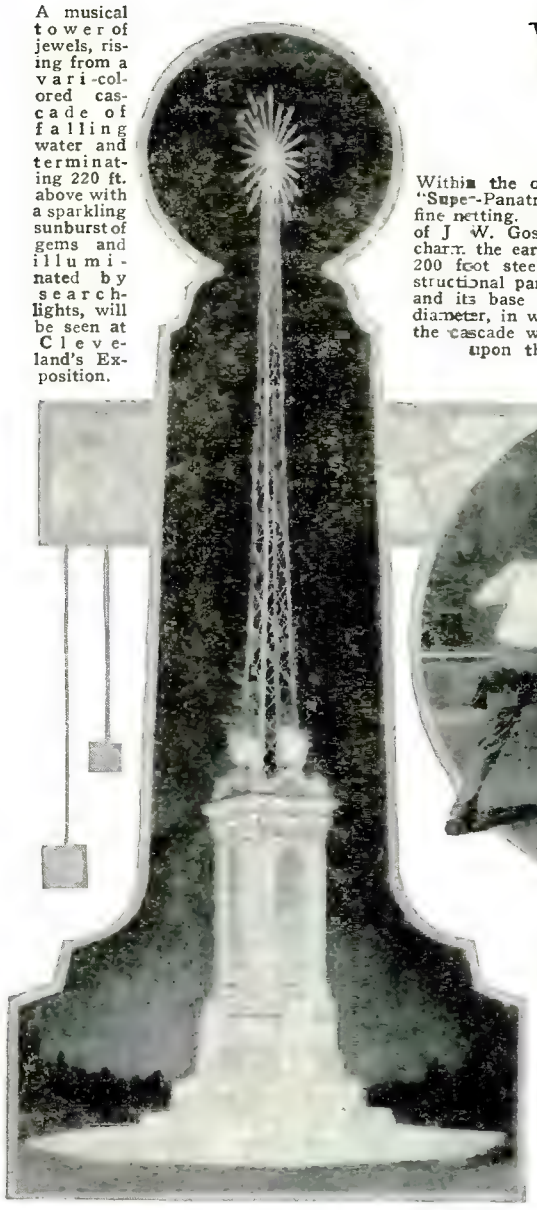
In a test made a few years ago in a well-known engine testing laboratory near New York City, an eight cylinder engine of a well-known and expensive American type was put on the testing block, with suitable recording apparatus attached to the engine valves, in order to see what really happened at different speeds. This engine had a normal maximum speed of twenty-eight hundred revolutions per minute; at the usual range of speeds up to twenty-eight hundred r. p. m. the valves worked very well, opening and closing as perfectly as could be expected with a poppet valve design. At a speed of thirty-six hundred r.p.m. it was found that the engine was not developing any extra horsepower, except that required to keep its reciprocating parts in motion, which action was predicated particularly on the fact that, as the recording instruments showed, the valves were standing about halfway between the fully opened and fully closed positions. In other words, the engine shaft was revolving so fast that the poppet valves could not follow at this speed. This condition no doubt occurs in many engines today, within the range of their normal rated speeds; and moreover valves often do not close or open fully owing to carbon deposits. Air leakage around the valve stems is another serious trouble met with in trying to make an old poppet engine run smoothly, especially when throttled down. These things cannot very well happen to a sleeve valve engine of the type here illus-

(*Continued on page* 660)

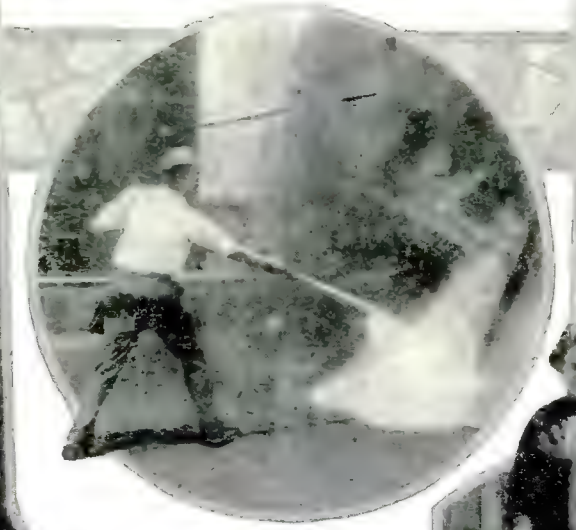
www.americanradiohistory.com

With the Science Reporter

A musical tower of jewels, rising from a vari-colored cascade of falling water and terminating 220 ft. above with a sparkling sunburst of gems and illuminated by searchlights, will be seen at Cleveland's Exposition.



Within the ornamental cascade, shown at the left, six "Super-Panatropes," will be concealed behind panels of fine netting. This unique electrical spectacle, the creation of J. W. Gosling of the General Elec. Labs., will both charm the ear as well as please the eye of thousands. A 200 foot steel radio tower is being used for the main structional part. This will be set in 30 tons of concrete and its base will be surrounded by a basin, 90 feet in diameter, in which water from the decorative fountains of the cascade will fall. A battery of floodlights will play upon the water falling from the fountains.

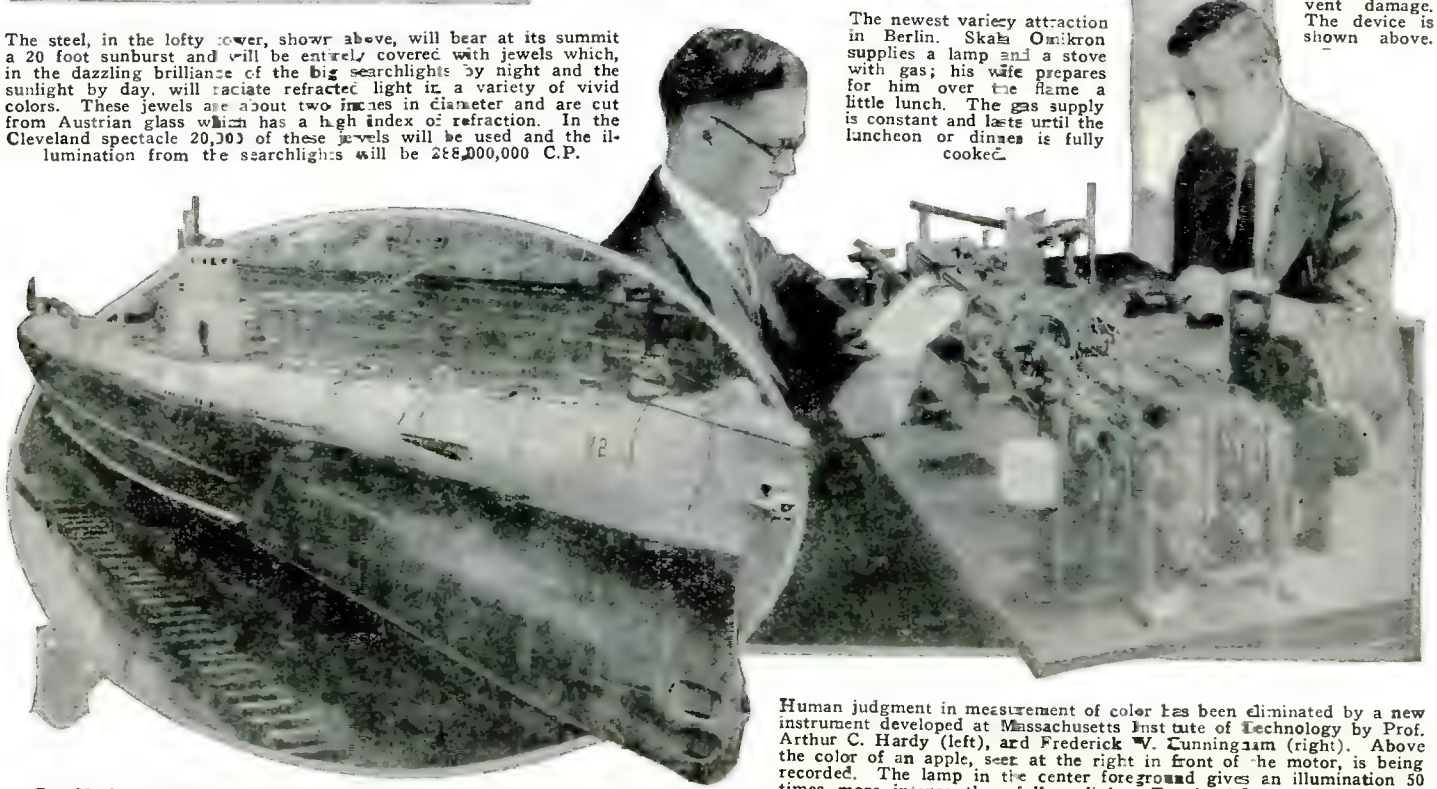


A new fire extinguisher which puts out flames by freezing them, was demonstrated recently in the plant of the General Carbonic Co. at Long Island City. The release of the gas to the atmosphere so chilled the gas that part of it solidified, forming an intensely cold "snow." The "snow," instead of melting, changed instantly into a gas. This vaporization process absorbs heat from the burning material

A photographic device, that operates so quickly that it reveals what occurs in a millionth of a second, or even a fraction of such a brief interval, has been perfected in the Laboratories of the General Elec. Co., at Schenectady, N. Y., and is used to study the effects of lightning on electrical apparatus and in developing ways to prevent damage. The device is shown above.

The steel, in the lofty tower, shown above, will bear at its summit a 20 foot sunburst and will be entirely covered with jewels which, in the dazzling brilliance of the big searchlights by night and the sunlight by day, will radiate refracted light in a variety of vivid colors. These jewels are about two inches in diameter and are cut from Austrian glass which has a high index of refraction. In the Cleveland spectacle 20,000 of these jewels will be used and the illumination from the searchlights will be 268,000,000 C.P.

The newest variety attraction in Berlin. Skala Omikron supplies a lamp and a stove with gas; his wife prepares for him over the flame a little lunch. The gas supply is constant and lasts until the luncheon or dinner is fully cooked.



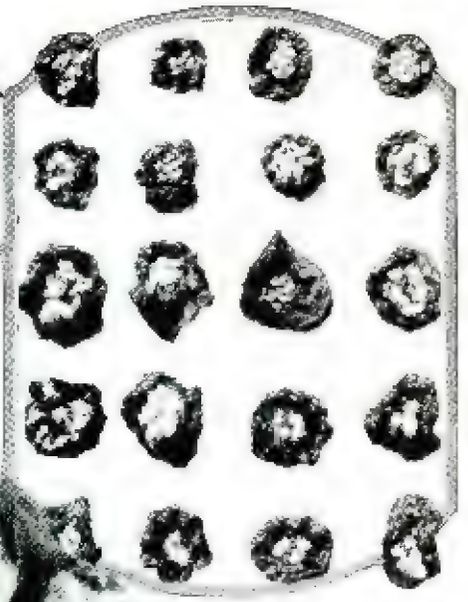
The U. S. Submarine V-2, the latest and largest of its kind, is shown in dry-dock at Charleston Navy Yard, Boston, Mass.

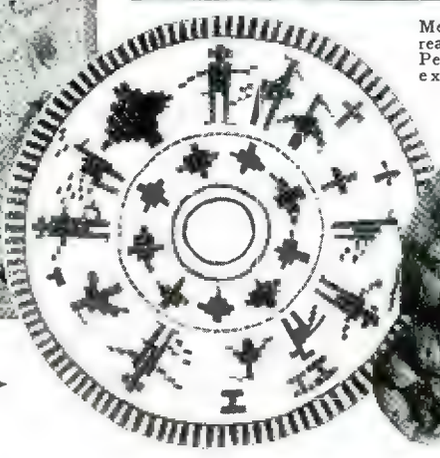
Human judgment in measurement of color has been eliminated by a new instrument developed at Massachusetts Institute of Technology by Prof. Arthur C. Hardy (left), and Frederick W. Cunningham (right). Above the color of an apple, seen at the right in front of the motor, is being recorded. The lamp in the center foreground gives an illumination 50 times more intense than full sunlight. To the left of the lamp is a block of magnesium carbonate, whitest substance known, used as the basis for color comparison.

www.americanradiohistory.com

Above in the upper left, is the altar where the Peyote ceremonies are held. A shield bearing a symbolic reproduction of the Peyote, may also be seen; the nine figures in the center representing the Divine Fruit.

Mexican Indians ready to go on a Peyote gathering expedition are shown above.





At the left may be seen one of the Peyote cacti. Above are several mescal buttons, the berry of which is found in the flower of the Divine Peyote plant.

Peyote—Mystic Fruit of Mexico

By Count A. N. MIRZAOFF

PEYOTE is a rare species of cacti found on the slope of the Mexican mountains at great altitude, it is also found on the bank of the Rio Grande del Norte (Texas). Peyote was recognized by the ancient people of Aztec as containing extraordinary properties, which produced beautiful dreams after being taken into the system. Sahagun, writing in the 16th century, says, "Black mushrooms (dried peyote) were eaten at feasts, after which some danced, some sang, and others sank into meditation." According to the latest investigation, peyote has more of a psychological effect, rather than physical upon the mind of the Indians who have been using it for centuries.

However, if peyote is eaten fresh, it will produce a stimulating effect only; while if taken in a dried state, it produces marvelous visionary dreams, without even falling asleep.

According to a vivid account in the *American Anthropologist* as reported by a man who had partaken of this divine fruit he says: "After I had taken twelve beans of peyote, I saw a mountain with roads leading to the top and people were dressed in white and they were going up these roads. I got very dizzy, and I began to see all kinds of colors, and arrows began to fly all around me. I began to hear voices, just as if they were all over the ceiling, and I looked around in the other room and thought women were singing in there, but women were not allowed to sing in the meeting, and so this was kind of strange. After eating thirty-six of these peyote beans, I simply got very drunk. . . . I began to see a big bunch of snakes crawling all around in front of me, and it was a feeling as if I was cold came over me. The treasurer of the sacred peyote society was sitting next to me and I asked him if he heard young kittens; it sounded as if they were close to me, then I sat still for quite a long time and I saw a big black cat coming toward me and I felt him just like a tiger walking up on my leg toward me; and when I felt his claws I jumped back and kind of made a sound as if I was afraid." (This is from a sworn affidavit by a peyote user, as reported to a Mr. Daika.)

The following report is by Mr. Gilman, an investigator for the American Anthropological Society. "He was an ordinary reservation Indian, who had had some schooling and had been in Washington and other eastern cities. The report tells of an occasion in which some Christian Indians had been indulging in Peyote ceremonies.

Peyote, a rare species of cacti that provokes marvelous visionary dreams. Its new physiological properties have just been discovered by Alexander Rouhier of the Paris Museum of Natural History. It may be used on criminals to make them confess.

It says, the opening of the meeting consisted of reading the Bible and the story happened to be of the Hebrew Prophet who was taken up to heaven on a chariot of fire. The Indian who ate peyote fell into a trance-like state and afterward when he came to, described his vision. He related that Jesus had come for him in an automobile and had taken him up to heaven where he had seen God in all his glory in a splendid city, and with God he had seen many of the great men of all times."

The peyote ceremonies of the Tarahumare Indians, are precluded by a ceremonious pilgrimage to the peyote country for the purpose of securing the plant. The company chosen for this hazardous trip is purified with copal incense before the start of the long journey. Although several days are consumed in the journey to the land where peyote grows abundantly, the men are forbidden to eat anything until they arrive, when they may eat only pinole. The first act upon arriving among the peyotes is to erect a cross before which a fresh peyote is placed and this particular peyote is supposed to disclose the location of other peyotes. Following this, raw peyote plants are eaten and further work is postponed until the following day, that is when the intoxication has worn off. Peyotes are then gathered with a certain ritual and the company returns home, usually having spent weeks and sometimes months on the journey.

One of the strangest sects of this cult who have been following the custom of their forefathers (notwithstanding the efforts of the civilized missionaries) are the Huichols Indians of Mexico. The spread of this strange cult among other tribes of Indians throughout Mexico and the United States, has been attributed to the Huichols tribe. The peyotleros (the pickers of peyote) wear bizarre costumes, and dapple their faces with variegated colors, symbolizing the harvest of the divine plant "Hicouri" (as it is called by the Indians themselves.) This band is usually made up of hardy men who must stand strict examination as to their ability to withstand privation, hunger, even death. They have been known to travel almost 400 miles in search of Hicouri by traversing some of the most arid territory of Mexico, infested with all kinds of snakes and insects and baked under the intense heat of the tropics.

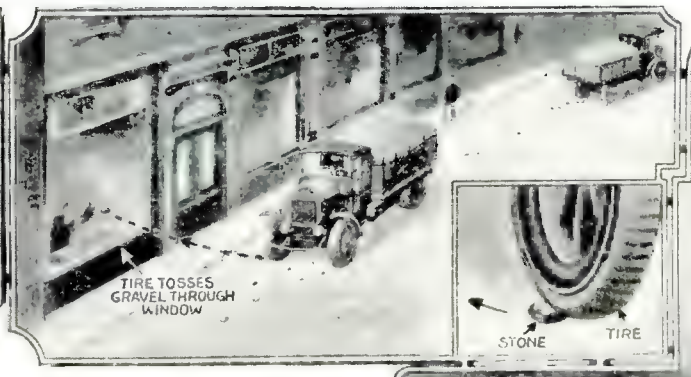
(*Continued on page* 647)

www.americanradiohistory.com

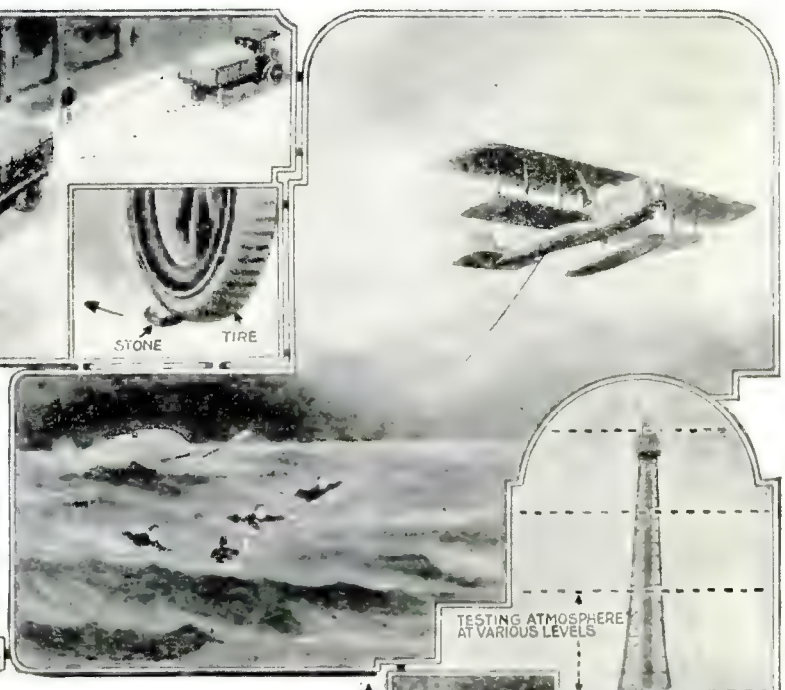
The Month's Scientific News Illustrated

By GEORGE WALL

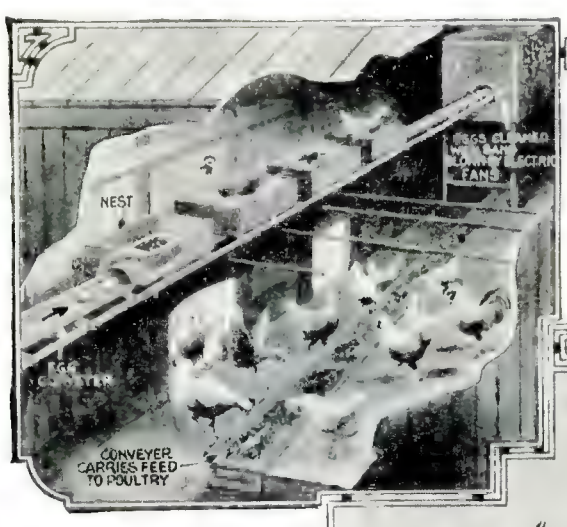
Bill Jenny has been tending and winding the 1,050 clocks of the Savoy Hotel for many years. He claimed that at any hour of the day he could tell the correct time within one-half minute. Recently he was put to test by members of the British Medical Society and the greatest divergence he made was one of only three-quarters of a minute.



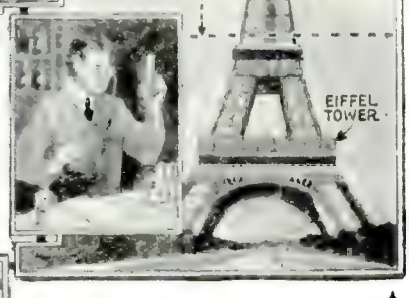
Members of the Fifth Avenue Association recently sent a letter to Police Commissioner Warren urging stricter enforcement of the regulation requiring trucks carrying gravel to be covered. The Corn Exchange Bank has replaced its front window four times since the middle of February. The passing gravel trucks dropped stones on the street, and they were sent flying across the pavement by the automobile wheels.



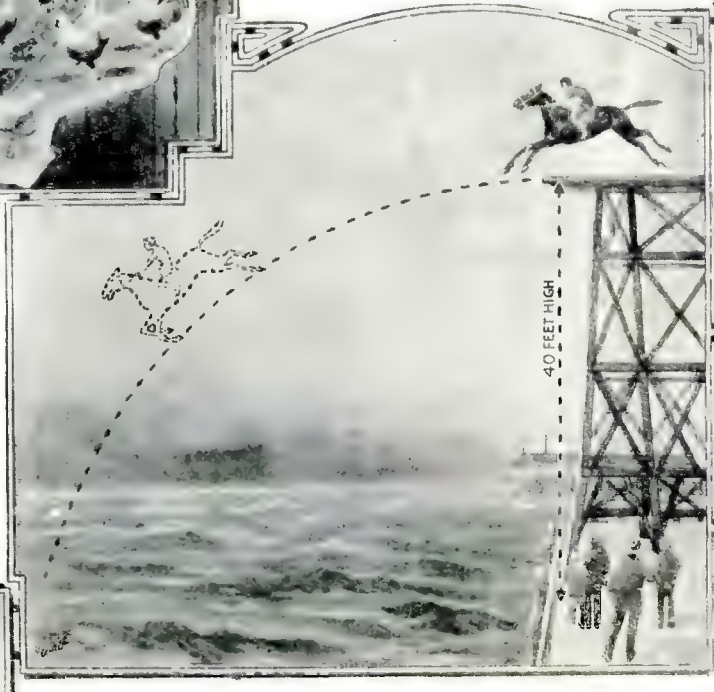
Four boys were saved from drowning by the brilliant manoeuvering of a seaplane by Lt. Fred Priestly. The boat occupied by the youths, capsized a mile out in Lake Michigan. Flying low, Priestly dropped them a line and towed them ashore. They were jerked from the water when they caught the rope, but Priestly lowered his plane until its pontoons touched the surface and then taxied to the shore, landing them safe and sound.

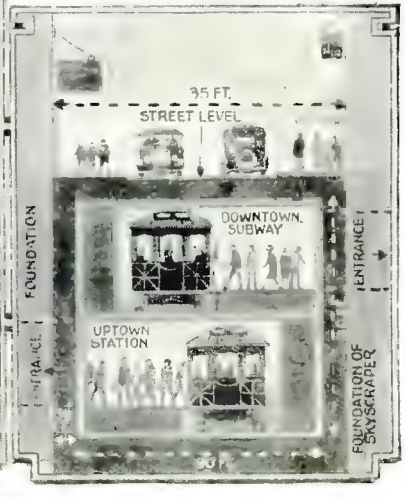


In Petaluma, Calif., the use of electricity in henhouses has been more highly developed than anywhere else in the world. Not only are the incubators and brooders controlled by electricity, but electrically run conveyers carry feed to the poultry house and eggs to the packing room, where they are cleaned with sand, blown by electric fans. This use of electricity on the poultry farm has done much to lighten the labors of the farmer and also has helped to keep the coops cleaner than before.



Using the various platforms of the Eiffel Tower as points for experimentation, officials of the Municipal Laboratory of Toxicology tested the odors of Paris, by exposing test tubes containing various chemicals effectual for the purpose, to the action of the atmosphere at various levels.





A bed which rocks its occupants to sleep, like a baby in its cradle was constructed by the National Physical Laboratory, at the special request of Sir Alfred Yarrow, a British scientist. It is now one of the wonders on view at the exhibition of the Institute of Civil Engineers. The bed is rocked by an electric motor. The movements of the bed are arranged to occur at the rate of eighty per minute and are 3/8" to 3/4" in range. Nausea is avoided by making the movements irregular.

Miss Lorena Carver has inaugurated a new amusement for the summertime. Sitting upon her horse, Miss Carver leaps into the sea from a height of forty feet. According to his owner, the horse has been rehearsing his diving for almost twenty years and now can dive almost as well as he can walk. The Municipal Court of Los Angeles will decide whether or not the horse is being treated in a cruel and inhuman manner, by being made to jump into the ocean from the forty foot platform at Ocean Park, at Los Angeles, California.

A subway loop or link is to be built beneath Nassau and Broad Streets in New York City. The subterranean road will be a two track route; but the tracks will run, one above the other. For that reason the excavation will be bigger than usual and will extend downward from thirty to thirty-five feet for its entire length. This loop will cost $13,000,000 and entail such difficulty as New York has never before experienced in its many years of subway construction. It will raise new problems that will challenge engineering skill. The Fulton Street and Wall Street stations will also be enlarged.

www.americanradiohistory.com

Newton held to the "emission or corpuscular theory of light."

The Rôle of Wave Length in Theories of Radiation*

By F. K. RICHTMYER

Professor of Physics at Cornell University and past-President of Sigma Xi

The Dutch physicist, Huyghens, famous for his undulatory theory of light.

FOR two and a half centuries physicists have been trying to answer the question: "What is radiant energy?" Or, in somewhat less technical language, "What is that 'something' which, starting from the sun, and rushing through space at the rate of 186,000 miles per second, brings light and heat and cheer and life to the earth; what is it which, leaving the filaments of incandescent lamps in a room proceeds to our eyes after reflection

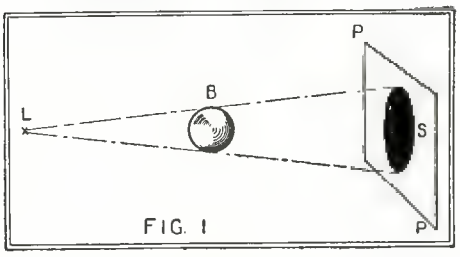


FIG. 1

Light travels in straight lines. Thus shadow S cast on the screen PP by the ball B is a sharp shadow, if the light source L is a small (or "point") source.

from the various objects near us and causes the sensation of vision?"

Answers to this question have been given by various scientists and groups of scientists. Some times one answer has been given; some times another, and I have chosen to discuss this subject upon this occasion because more than any other subject perhaps in the whole history of science, it illustrates the importance of these fundamental principles for which Sigma Xi, the Society which brings us together this evening, stands, namely, the search for truth and the reception of truth whenever found with an open mind and with a readiness, when incontrovertible experimental evidence becomes available, to discard theories, however long established, which are in conflict therewith.

The discussions concerning the nature of light assumed definite form about two and one-half centuries ago, when two great scientists, whose names are now almost household words in physics, gave different answers to the questions above raised, each on the basis of his own best judgment of the experimental data then available. These two great men were Huyghens, the Dutch physicist, who lived during the seventeenth century; and his younger contemporary, Newton, that great English scientist and philosopher, the 200th anniversary of whose death has just been observed throughout the scientific world.

WAVE THEORY OF LIGHT

Huyghens, knowing the tremendous speed with which light travels, thinking it impossible that material bodies, for example, could travel at that rate, concluded that light must be a *wave motion* in a substance called the *ether* which, according to his hypothesis, filled all space between the sun, the planets and the stars, and even permeated the "pores" of transparent bodies, such as glass and water. Huyghens pictured this wave motion in the ether as analogous in every way to the wave motion of sound through the air, except that the velocity of light is many hundred thousand times greater than the velocity of sound. Thus was born the so-called undulatory or wave theory of light.

CORPUSCULAR THEORY OF LIGHT

Newton, on the contrary, although realizing the importance of these arguments put forward by Huyghens, gave greater weight to the experimental fact that light travels in straight lines, whereas sound, it is well known, "bends around corners." Thus, if an opaque object be interposed between a

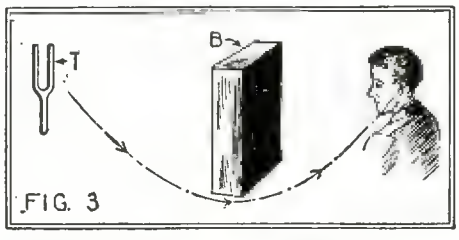


FIG. 3

Sound bends around corners. You can hear a tuning fork T even if a solid block B intervenes between the fork and your ear. (Illustrating Newtons objection to Huyghens' wave theory of light.)

light source and an opposite wall, a sharp shadow of that object appears on the wall; whereas if a solid obstacle intervenes between the source of my voice and your ears, you have no difficulty in hearing the sound. Accordingly, Newton suggested that, since light travels in straight lines unless it is reflected or refracted by some material body and, since projectiles or moving bodies, such as rain drops likewise travel in straight lines unless deflected by impact with some other object, the arguments are very strong in favor of light being *a motion of very minute corpuscles or small bodies,* in somewhat the same way as a rain shower is a motion of small droplets of water. Light, according to Newton, consists of swiftly moving particles; and thus was born the so-called *corpuscular* theory of light.

During the life times of Huyghens and of Newton, some scientists agreed with one theory, some with the other. But for nearly a century after Newton's death, there was no further addition of experimental evidence on the basis of which to reach a decision as to which of the two theories was correct. Perhaps because of the greater prestige of Newton, perhaps because greater weight was given to the experimental fact that light travels in straight lines, the wave theory almost entirely disappeared during the first half of the eighteenth century, and from 1750 to 1800 nearly every scientist supported the corpuscular theory.

INTERFERENCE OF LIGHT BEAMS

In 1802, however, occurred a very momentous event in the history of science.

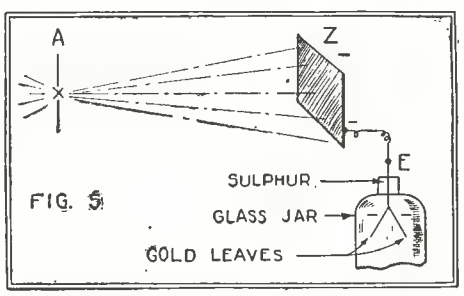


FIG. 5

Above we have a diagram of a simple experiment which shows the photo electric effect. No effect is observed if the plate is charged with positive electricity.

In that year Thomas Young, the English scientist, discovered a new experimental fact, namely, the now well-known phenomenon of interference of two beams of light. He demonstrated that it was possible for two beams of light starting from the same source and traveling by slightly different paths, to fall on a surface at the same point and produce on that surface *not light, but darkness;* that is to say, one beam of light exactly neutralized or cancelled the effect of another. Accordingly, Young assumed, and no one since that time has succeeded in proving that the argument is untenable, that this phenomenon of interference could be explained only *if light be a wave motion.*

Let me illustrate; if you drop a series of stones, one after another into a pond of water, you send out waves. A chip floating on the surface of the water will bob up and down as the train of waves passes. You can quite readily imagine another series of water waves related to the first in such a

(*Continued on page* 653)

*This article comprises the text of an address given before the joint annual meeting of the Union and the Rensselaer Chapters of Sigma Xi at Schenectady, N. Y., and is published in SCIENCE & INVENTION Magazine by permission.

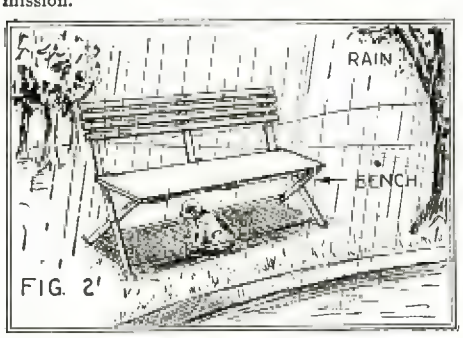


FIG. 2

Rain drops move in a straight line. The bench "casts a sharp shadow" just as did the ball in Fig. 1 (illustrating Newton's argument in favor of the corpuscular theory of light)

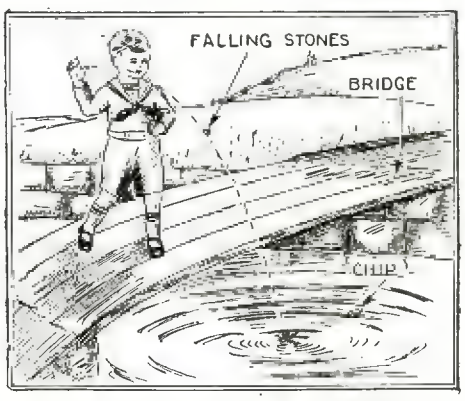
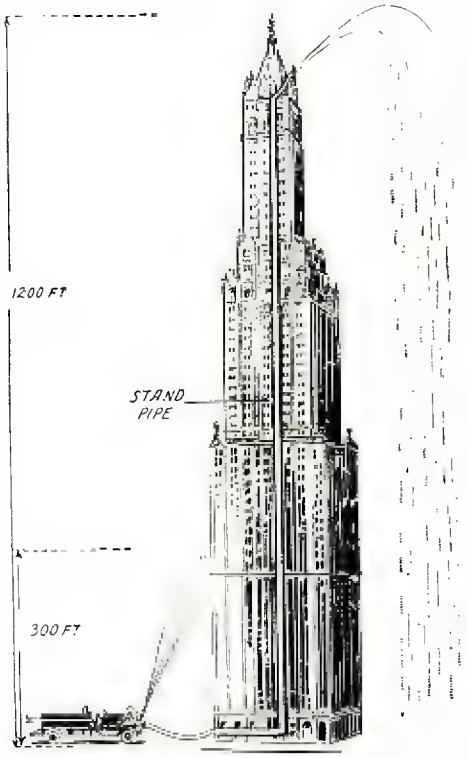


Fig. 4. A wave motion similar to that set up in the ether, according to Huyghens' theory.

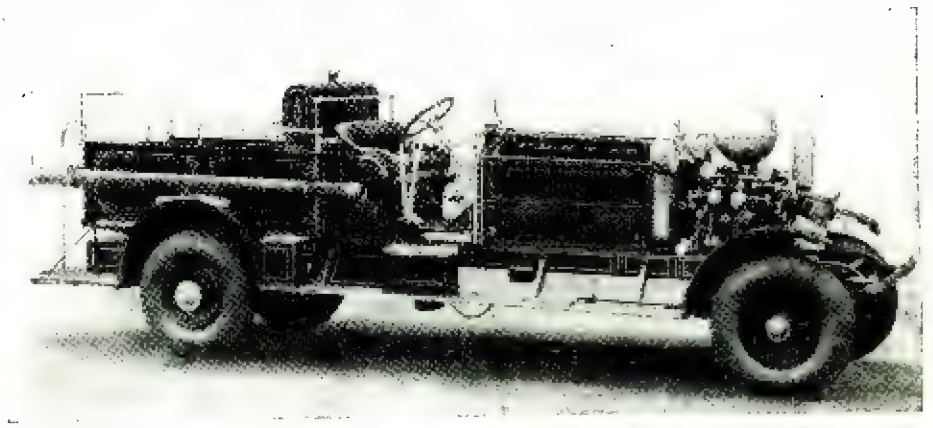
www.americanradiohistory.com

Fire Engine Raises Water 1200 Feet



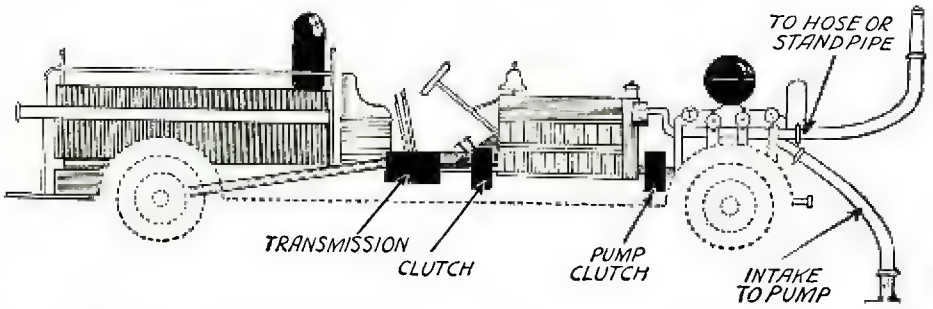
The illustration above shows how it will be possible to protect the largest buildings, by using this new fire engine. It will throw a stream of water over three hundred feet into the air, and will pump water with sufficient compression for use over twelve hundred feet.

with the placing in service of a new fire engine. It is rated at one hundred and forty horse-power, weighs twelve thousand six hundred pounds, twenty-four and one-half feet long, and is equipped with a six cylinder piston pump, designed to deliver one thousand gallons of water a minute under a pressure of one hundred and sixty pounds to the square inch at the pump. The pump taking water from the river through two suction inlets and discharging it again in two, two and one-half inch streams of battering force, developed a pressure of five hundred and twenty pounds, when tested. From a wealth of technical details, several facts about the new pump stood out most clearly. The six pump cylinders may be used either as a whole or in units of three, one side of the pump delivering approximately sixty per cent of the rated capacity, and the other three cylinders forty per cent. The pump controls are so located that they can be handled from either side of the engine. There is a separate clutch for the pump entirely apart from the driving clutch. The machine will travel forty-five miles an hour, is equipped with a friction-driven siren, exceeding in power any similar device. Pneumatic tires thirty-eight by nine inches are another innovation.



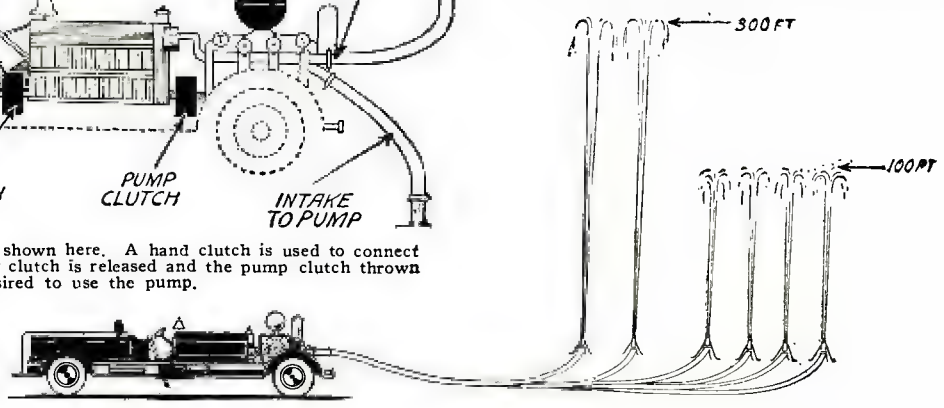
The complete fire engine with its six cylinder pump is shown here. This engine is twenty-four and one-half feet long, which is more than six feet longer than the four cylinder pumpers now used in New York City.

Photo courtesy of Ahrens-Fox Fire Engine Co.



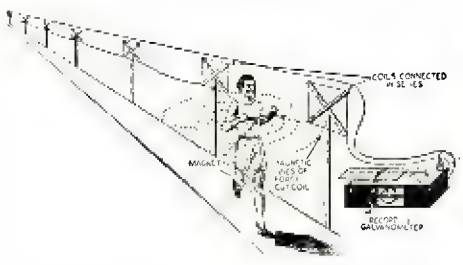
The clutch arrangement on the new fire engine is shown here. A hand clutch is used to connect the pump to the motor of the truck. The regular clutch is released and the pump clutch thrown into place when it is desired to use the pump.

The illustration below shows how it would be possible to throw two streams of water three hundred feet into the air, or four streams one hundred feet. Of course where stand pipes are available, the stream can be sent to a height of 1200 feet.

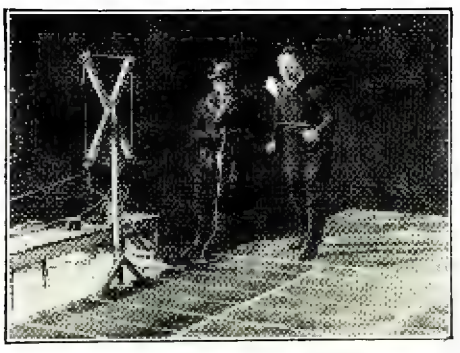


THE question of adequate fire protection for the upper floors of the tall apartment, hotel and office buildings of New York, is believed to be effectively settled

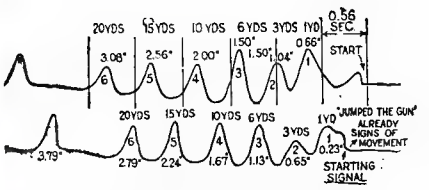
Electric Device Records Runner's Time



A device was recently tried out to prevent runners from jumping the starter. It consisted of a number of coils placed along the side of the track, as shown in the illustration above. These coils are placed in series and connected to a recording galvanometer in conjunction with a siphon pen. When the runner with a magnet strapped to his chest passes the coils, the galvanometer is deflected.



Just before the word "go" is given, the starter closes an electric switch and starts the apparatus working. If the runner has jumped the starter, it will be shown on the graph record.



The two records above show how the device proves conclusively whether a runner has started before the signal or not. In the upper graph the runner started immediately after the signal, and the deflections show when he passed the given points on the track. The lower graph shows how the record indicates the runner jumping the mark. You can see how a sign of movement is perceptible even before the starting signal, as indicated by the arrow. The use of this apparatus will make sprinting a much fairer sport in the future since it will be possible to tell exactly when each runner started.

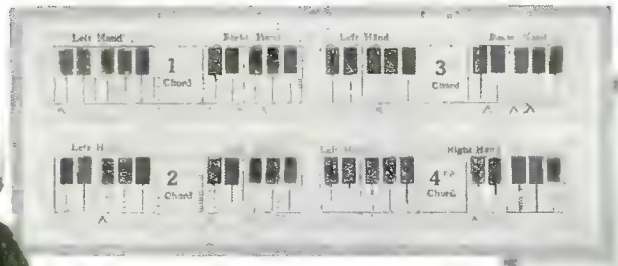
www.americanradiohistory.com

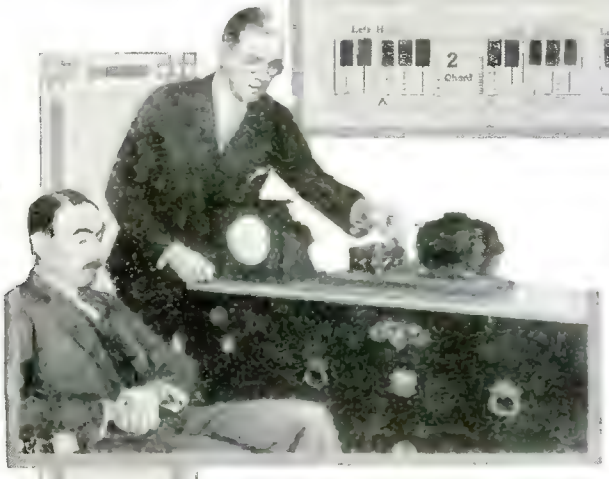
A new musical novelty has recently been inaugurated in Germany. Girls, dancing upon a gigantic keyboard, actually played the music.

Newest Musical Progress

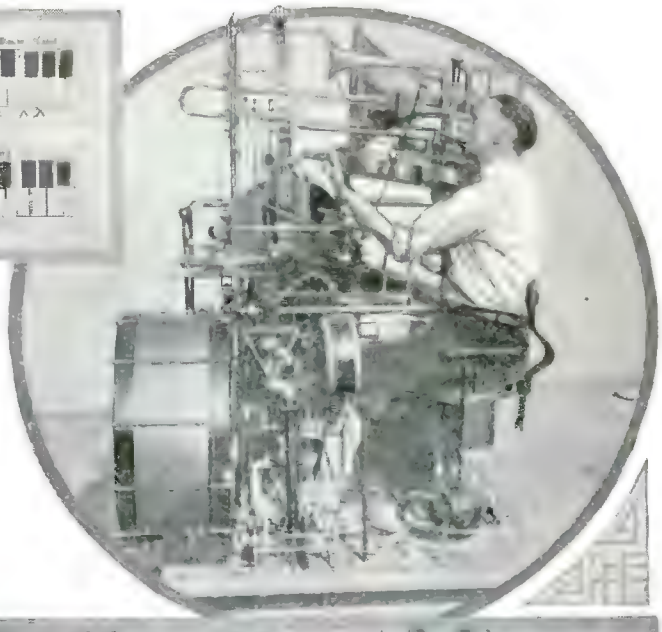
Photos Show Latest Advances in Musical Science

At the right, we have a photo showing a keyboard which enables a pupil to play music by sight. This system has been developed by Prof. La Fontaine.





The photo at right shows Albert Nelson with his twenty-two piece orchestra which he plays all by himself. In playing this novelty, he uses mouth, hands, feet and knees.



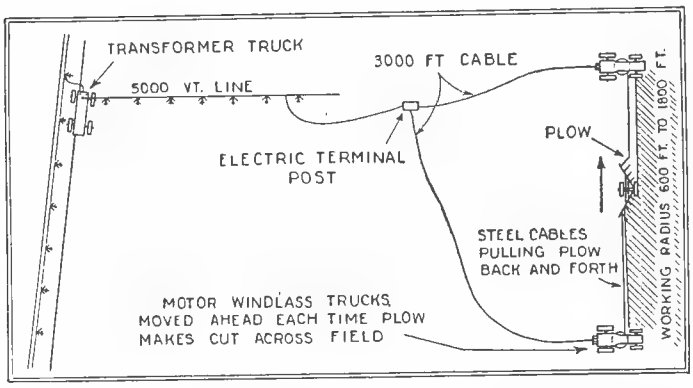
The above photo shows a new device for relieving deafness.

A new method of piano teaching the "Visuola, a system of lights which guide the student as to the note to be played, is shown in use above. At the right we have a new invention which makes use of the healing power of music or sound wave therapy.

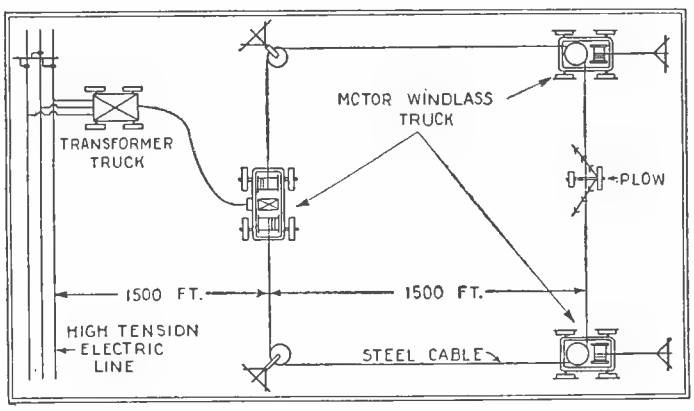
www.americanradiohistory.com

Electricity Speeds Up Crops

Electro-Cultivation Raises Plants in Record Time


TRANSFORMER TRUCK
5000 VT. LINE
3000 FT CABLE
PLOW
ELECTRIC TERMINAL POST
STEEL CABLES PULLING PLOW BACK AND FORTH
MOTOR WINDLASS TRUCKS MOVED AHEAD EACH TIME PLOW MAKES CUT ACROSS FIELD
WORKING RADIUS 600 FT. TO 1800 FT.

The diagram at the left shows how French farmers use electric motors to drive plow. The current supplied to the motors is at 5000 volts.



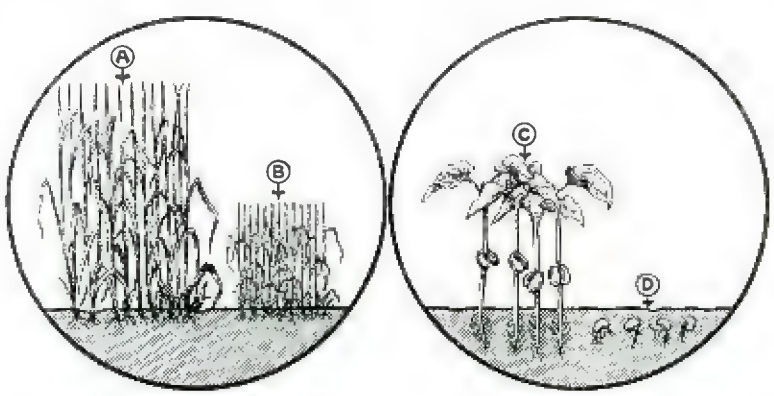
At the right we have another diagram showing the arrangement of trucks and steel cable which moves the plow back and forth.

ELECTRO-CULTIVATION of the soil, by impregnation with numerous working voltages of electricity, through the medium of a plow, has been tried out in a number of experiments, with good results. The process is the invention of Hamilton L. Roe, who declares that it not only eliminates weeds and destroys bacteria, but restores the fertility of farm lands and produces crops in record time.

In the experiments made at Rochester, N. Y., as much as 103,000 volts of potential were used. Buckwheat seeds have been made to germinate in 80 hours with this new electrical process, and corn, beans and potato seeds have been germinated in five days, while 16 days were required for the germination of seeds sown in ordinary fertilized soil. Seeds are germinated in 5/16 the time ordinarily taken.

The Swedish agricultural department has also been conducting experiments in forcing the cultivation of farm products and flowers by means of heating the soil with electricity. The first attempt to warm the soil was made with a current of 5 to 25 volts sent through a lead wire, not insulated, which ran under the ground. This method, however, was found to be impractical, due, in part, to the high cost of operation. The next trial was made with a specially manufactured heating cable. These devices were tried in six forcing beds and the results obtained were quite satisfactory.

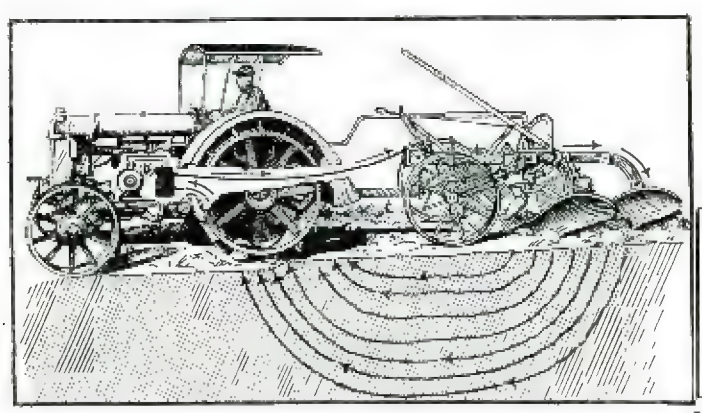
The wires used for the electrical heating of the soil were made of nickolin (an alloy of nickel and steel), in order to get the necessary resistance to produce the heat. The wire is insulated with asbestos and covered with a coating of lead. The resistance varies between 22 and 35 ohms. These heating wires are encased in clay tubes and reach a temperature of about 400° Centigrade, whereby all moisture in the neighborhood of the wire is removed. In open field experiments it was found that only 5 per cent of the current was lost through short-circuiting with the ground. Wires about 100 feet in length gave the best results. Soil, treated in this manner in the evening, has generally been found 7 to 8 degrees C.: (12 to 14° F.) higher in temperature the next morning than unheated soil.



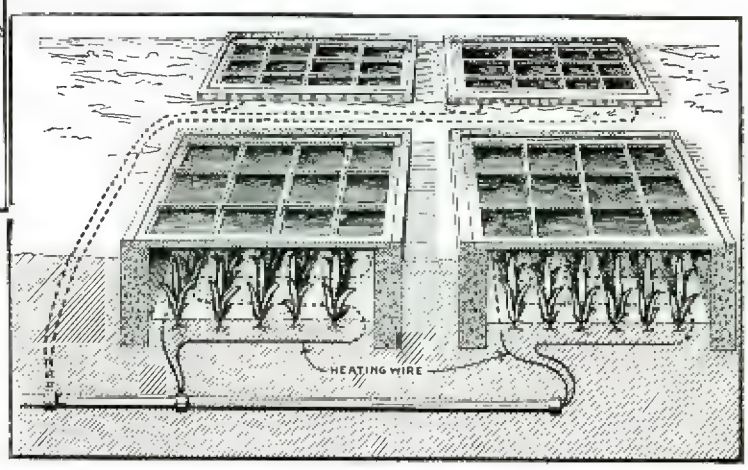
In the above A shows grain planted in an electrically treated soil, and grain in ordinary soil at B. Seeds are germinated in 5/16 time in electricated soil, as shown in C and D.

The French farmer's plow may be drawn either by an ordinary tractor or else is attached to a steel cable, which in turn is moved by a windlass, as in diagrams herewith. These motor windlass trucks are moved ahead each time that the plow makes a furrow across the field, as *La Nature* illustrates the French method of electrical plowing.

Not only does this marvelous plow speed up the growing of crops, but as the current passes through the soil it destroys weeds, shrubs and worms; thereby fostering the rapid growth of the plants. Late vegetables can also be kept in the ground for a period of time without rotting.



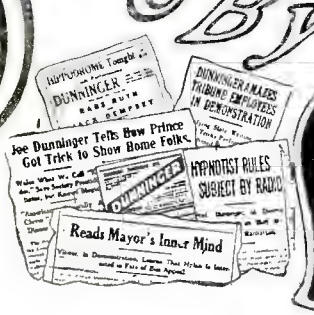
At the left we have an illustration showing the electric plow and also the path of current which passes through the soil, destroying bacteria, weeds, grubs and worms, thereby fostering the rapid growth of plants.



At the right, we have an illustration showing electrically heated forcing beds. Using this system, vegetables can be produced a month earlier than would otherwise be the case. They can also be kept in the ground without rotting.

www.americanradiohistory.com

MAGIC By "DUNNINGER"

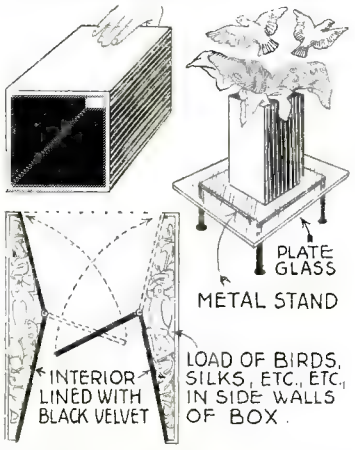


THE MAN WHO MYSTIFIED Pres. Coolidge Prince of Wales, Ex-Presidents Harding, Taft, Roosevelt, and other celebrities Writes Exclusively for SCIENCE AND INVENTION

Folks Are Mystified Yet Delighted by This Man!
Mind You! The Mind Reader Really Read the Mayor's Mind
DUNNINGER DRAWS MORE BIG CROWDS
Dunninger Will Attempt To Hypnotize Patient, 10 Miles Away, by Radio

NO. 56 OF A SERIES.

PRODUCTION CYLINDER

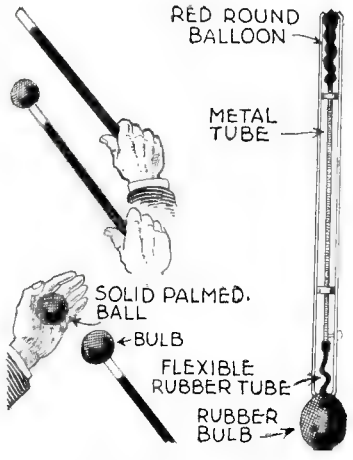


In the Chinese production cylinder shown at the left the compartments in the sides serve for holding the load.

HERE is a production open case which bases its results upon the perfection of an optical illusion. As will be seen, in the illustration above, a small metal stand is placed upon an undraped table. A sheet of glass is then put upon the stand. A four-sided tube, with neither top nor bottom, after being freely shown, becomes the mysterious production apparatus. With arms bare to the elbow, the magician withdraws from the same, flags, ribbons, pigeons, etc. The tube can be shown empty several times only to be replaced again and production of more material continued. As will be observed from the illustration, the load is concealed in the four sides of the tube, the walls of which are built upon an angle and the interior lined with black velvet. A short distance from the spectators, it is quite impossible for the human eye to detect the peculiar bulge of the inner walls. A series of catches hold the lids in place while the cylinder is being held up for examination.

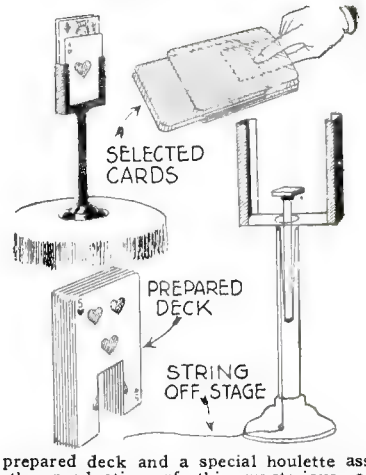
BALL CATCHING WAND

THIS trick is somewhat similar in effect to the well known coin catching wand. With the apparatus it is possible for the wizard to apparently catch four or five billiard balls upon the end of his magic wand. To all appearances, the device consists of a nickel-tipped black stick 14" long and ½" in diameter. The mechanism consists of a metal tube which may be pushed back and forth in the wand by the thumb. The billiard ball at the end is a round red balloon affixed to the tube at the opposite end there is a rubber bulb. By pressing the bulb and pushing the tube outwardly, the ball is made to appear at the end. A palmed solid ball is then apparently removed from the end of the wand under cover of which movement the tube is slid backward and the air released from the red rubber ball.



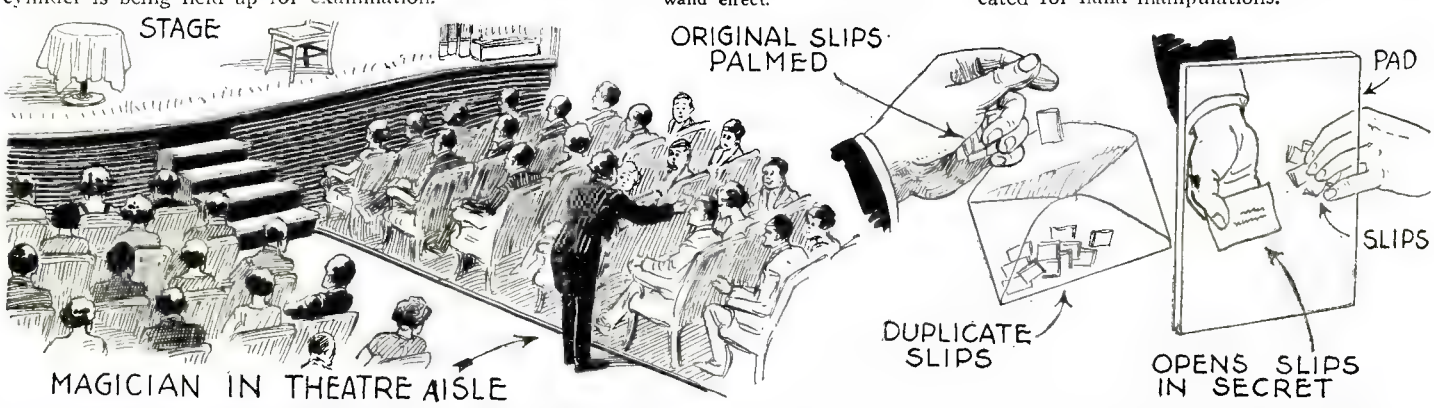
A wand fitted with a rubber bulb at one end and an inflatable ball at the other end is the mechanical requisite for the ball catching wand effect.

A DEMON HOULETTE



A prepared deck and a special houlette assist in the production of this mysterious card rising effect.

AN unprepared deck of cards is shuffled and three or four freely chosen. The balance of the pack is placed into an ornamental houlette after the spectators signed their names across the chosen cards to identify them and returned them to the deck. Slowly and mysteriously the cards rise from the deck at one time and are then identified as originals by the signatures. The cards are freely chosen from an unprepared deck, but as they are being marked, the magician exchanges the balance of the deck for a deck especially prepared with a slot as indicated in the drawing. A perfect card rests on top of the deck to hide the cut. The piston of the houlette naturally pushes the good cards up out of the prepared deck. The piston-like arrangement is operated by an assistant off stage and as the drawings indicate, the arrangement is simple. The same effect using the little finger can be duplicated for hand manipulations.



Many dealers in magical equipment are charging exorbitant prices for this effect, claiming it is the method employed by me in my performances on the Keith circuit. To prove that it is not, I am disclosing the system herewith. Several assistants walk among the audience distributing small slips of paper. The mind reader requests that the audience write names, addresses, etc. on the slips and fold them several times so that the writing cannot be seen. He then passes envelopes among the audience, requesting that groups of slips be placed into each of them and that they be retained by the writers. Seating himself on the stage with slate and pencil, he calls names, etc. Under cover of passing the envelope down the aisles, for the slips, the magician secretly palms some of the slips, permitting the rest and blank duplicates to remain in the envelope. The contents of palmed slips are subsequently read.

www.americanradiohistory.com

Conducted by GEORGE A. LUERS

DO YOU KNOW—

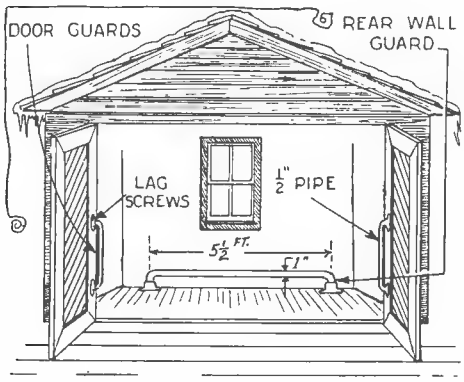
the starting motor is made more powerful by burnishing the commutator with sandpaper. Projecting ridges of mica should also be removed. One cleaning should last all winter.

NON-SKID GUARDS IN GARAGE PROTECT CAR AND BUILDING

Entrance to the garage or exit, when the ground is covered with sleet or snow, can hardly be accomplished with any degree of certainty. The car will side slip, or overrun, and the door frames, front end of the garage, hub caps, fenders and running boards of the car are damaged.

A set of pipe guards, as installed by one automobile owner, can be duplicated advantageously by any owner, to safeguard against the dangers from ice, snow or a night when the darkness makes it difficult to drive straight.

These guards are shown in the attached sketch, consisting of a forward guard, made of one inch pipe and flanges, secured to the forward part of the floor. The door guards are made up of one-half inch pipe and flanges, secured on the vertical sections of the door frame.



Non-skid guards placed in the garage as shown will protect the car and building. Each guard is made of bent pipe with end flanges.

The forward guard, serves to stop the car and avoid striking the garage with the bumper, fenders or headlights. The door guards keep the hubs, fenders or running boards out of contact with the doors or frame.

Now is the opportune time to install these guards, before winter ice and snows begin.

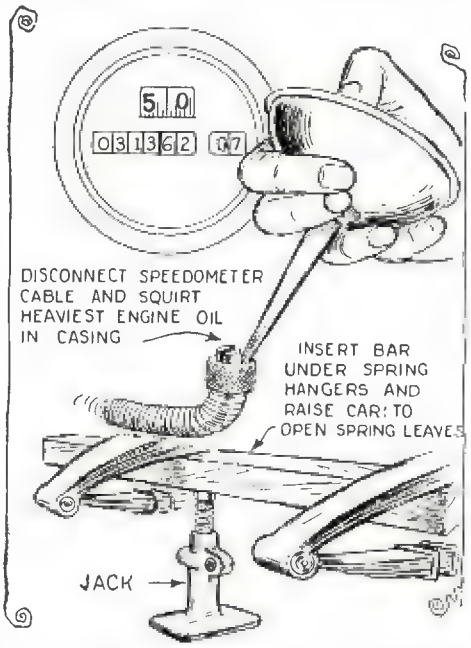
DEPENDABLE SPEEDOMETER AND LUBRICATED SPRINGS ADD JOY TO TOURING

Fall touring, can either be an endless joy or a repetition of difficulties, depending upon the condition of the equipment of the car.

A good dependable speedometer, registering distances and speeds, is most essential to pathfinding and keeping within the regulations which prevail on the highways.

The next detail of prime interest is the condition of the car springs. If these are unyielding and stiff, the discomfort will be noticeable throughout the entire tour.

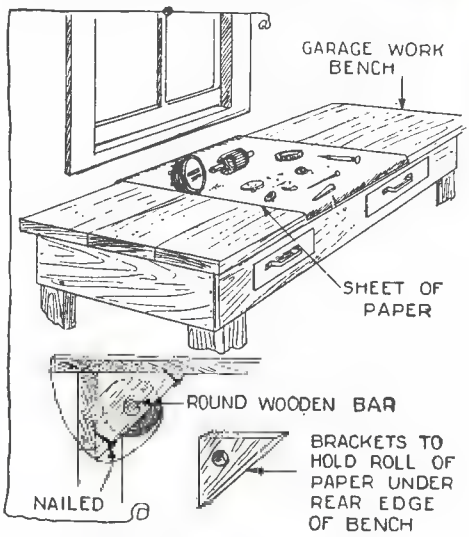
To place the speedometer in condition, it is advisable to first tighten down the bracket for the driving pinion and place heavy grease on the gears. Graphite grease is preferable. The coupling at the rear of the speedometer


DISCONNECT SPEEDOMETER CABLE AND SQUIRT HEAVIEST ENGINE OIL IN CASING
INSERT BAR UNDER SPRING HANGERS AND RAISE CAR TO OPEN SPRING LEAVES
JACK

The above illustration shows the various methods used in lubricating springs and speedometer cable. This cable should be removed and heavy engine oil squirted in the casings. A bar inserted under the spring hangers will open the spring leaves when the car is raised.

case should be unscrewed, and heavy motor oil should be squirted down inside the casing.

To condition springs, tighten down the spring fasteners, at the axle connections. Then place a wooden bar under the frame of the car, use a good jack, to lift the car body off the springs. Use a wire brush to scrape the rust from the edges of the leaves



If a roll of paper is installed on the work bench as shown, a clean working surface can always be assured.

and squirt engine oil with some flake graphite mixed in it along the open edges. The surplus oil along the sides should be wiped off.

It requires only a few minutes work to complete these tasks, however much satisfaction accompanies the work.

PAPER INSURES CLEAN BENCH FOR OVERHAULING ACCESSORIES

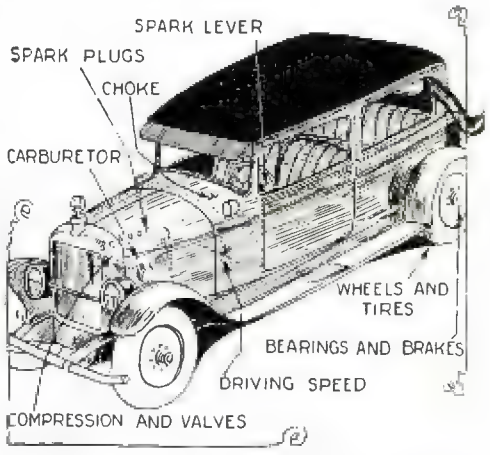
After overhauling a carburetor, vacuum tank, generator, distributor or delicate part of the car, especially the electrical details, it is frequently found these fail to function due to grit or small particles of dirt included with the assembly.

A piece of heavy brown wrapping paper over the bench top, serves to make a clean assembly and is resultful in speedy work and accuracy.

A desirable means for handling a small roll of paper is to place two wooden brackets under the bench, as indicated in the sketch. A tool handle for a roller completes the installation. The front edge of the paper is held readily by two or more thumb tacks. The car owner can then have a clean bench surface for a long period of repair work.

RULES OF ECONOMY FOR OCTOBER TOURS

THE driver contemplating a long vacation tour, will find it advantageous to put into practice the nine rules outlined below, for reason of economy and satisfaction that results from following



The various points on the car which should be attended to before a tour are shown in the above illustration.

good proven practice. The saving in gasoline, tires and oil will prove gratifying and leave spending money in the driver's purse. These are the rules, just try them out for the Fall tour.

1. Drain flush and refill the crankcase with the best grade of oil recommended by the manufacturer. Carry along one gallon of this same oil, as a reserve.

2. Adjust the carburetor to the leanest possible point and be certain the hot air connection to the carburetor is on. The cool days of Fall allow for use of the hot air connection.

3. Spark plugs should be cleaned, the points set to gauge, the distributor points in the ignition should be filed and adjusted.

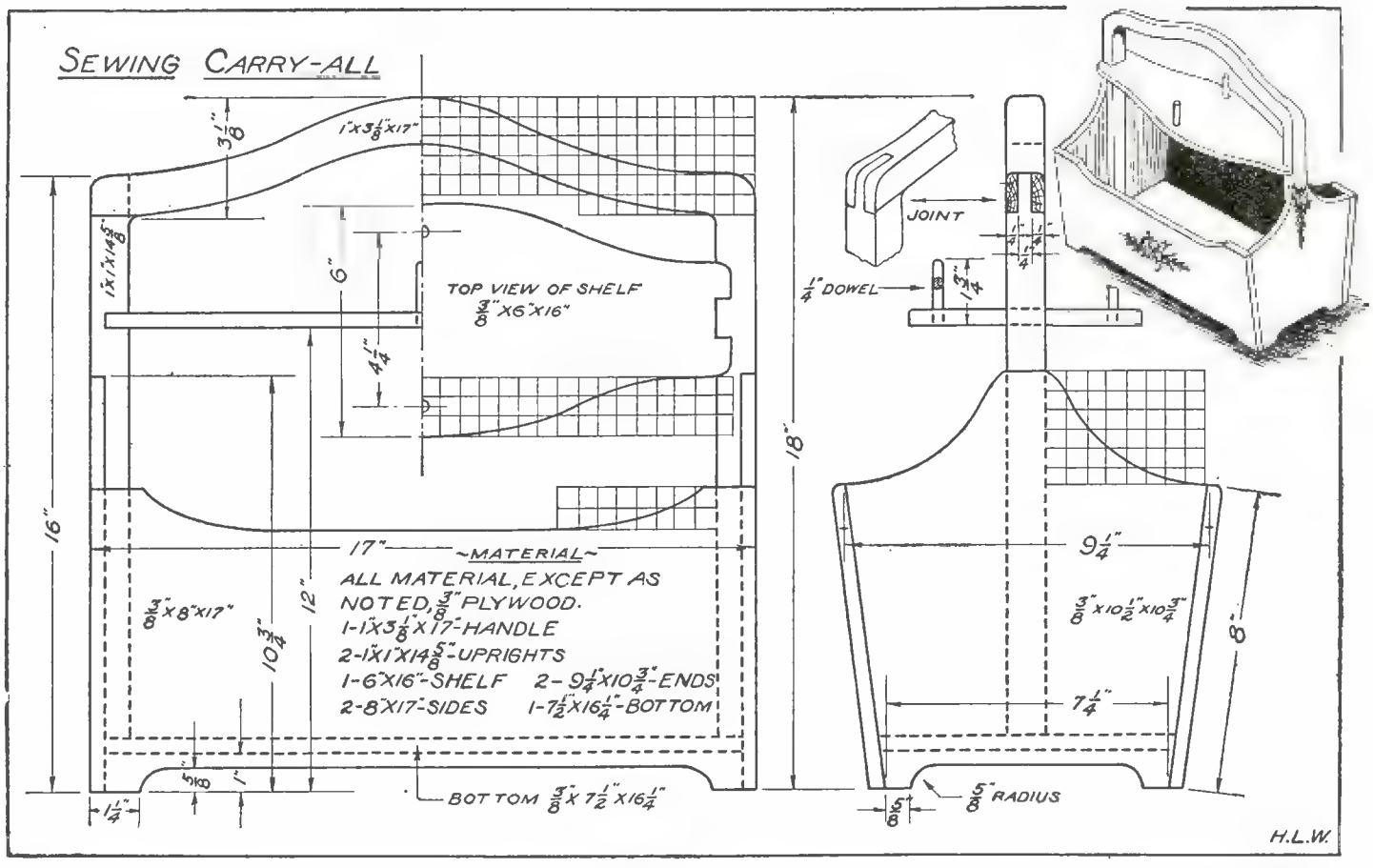
(*Continued on page* 656)

www.americanradiohistory.com

HOME MECHANICS

How to Make a Sewing "Carry-All"—

By H. L. WEATHERBY



The constructional details of the sewing "carry-all" are given in the illustration above. All material, except as noted, is ⅜ inch plywood.

A sewing basket of this nature is easy to construct, can be made with little or no difficulty, and will be welcomed by the mother, wife or sister.

THE Sewing Basket illustrated is aptly named "Carry-all" for it is really that. With it, mother, wife, or sister can carry all of her mending, sewing, or fancy work from one room to another, or to the neighbors for an afternoon. It is surprisingly light to carry and convenient. Its construction is extremely simple, and as a gift it will be prized very highly. It can be painted with one of the bright colored lacquers and will add a touch of color to sewing or bed-room.

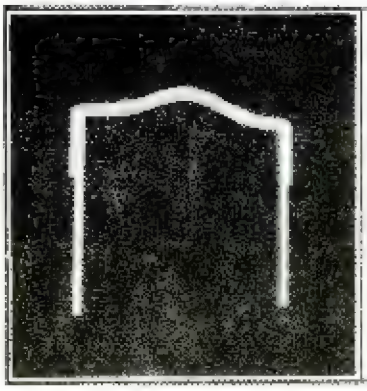
We must get our material before starting actual construction. Plywood is recommended since it is not likely to warp and comes dressed and sanded, thereby saving considerable labor, but ordinary wood will answer quite as well if carefully selected, hand planed and sanded. One thinks of plywood as being more expensive, but the cheaper grades, listed as drawer bottom material, if sanded two sides will paint up or lacquer quite as well as more expensive panels.

The material as given in the material list may be purchased cut to size at the mill, or a sufficiently large piece to make the number and the size required may be had and cut by hand. A fine saw should be used in cutting plywood since it splinters rather easily in working.

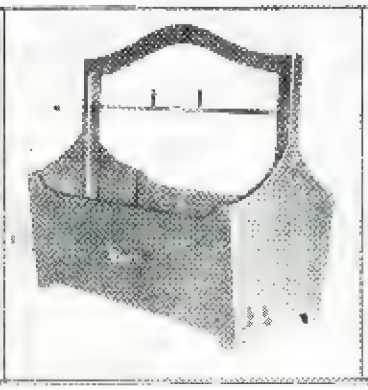
To get the most difficult feature of the work over with at the beginning let us start with the handle, which, of course, is not plywood material. Select a piece of good straight-grained wood, preferably poplar, and square to 1"x3⅛"x17". Lay out the design for the curves on a piece of cardboard and transfer it to the wood. Construct carefully the joints in the ends before cutting the curves. Now cut just outside the lines of the curves in the handle with bandsaw, if available, or hand turning saw, and smooth with spokeshave, file and sandpaper. This wood may be cut away, also, with hand saw and chisel if care is taken.

Shape to size next, and construct the

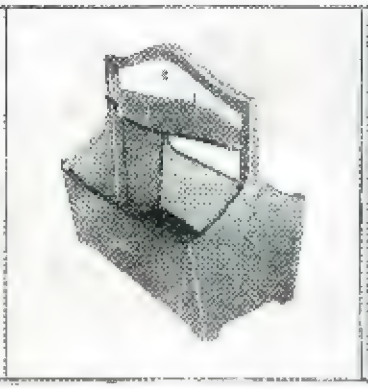
(*Continued on page* 655)



The handle of the "carry-all" is shown above.



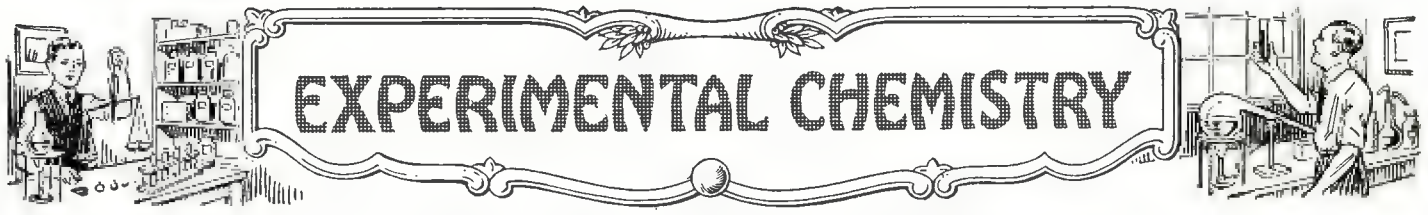
The completed sewing basket is shown here.



A view of the "carry-all" showing the interior.

The sewing "carry-all" is shown here in use.

www.americanradiohistory.com

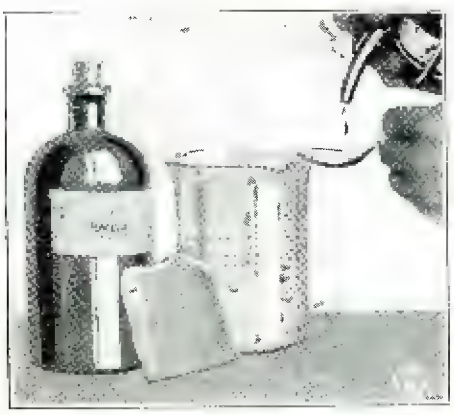


Tarnish and Rust Prevention

By DR. ERNEST BADE

IRON is a metal which causes the most trouble through rusting and this process is one that need not be permitted to take place when proper precautions are taken. In order to more fully understand the factors under which iron will be immune to rust, the conditions inducing rust must first be understood. It is invariably produced through either of two causes. The first agency is purely chemical in nature, the other is a result of a physical-chemical activity. The former is by far the more important as well as a more general producer of rust and it consists in the action of oxygen and carbonic acid on the iron in the presence of moisture. The first products that are formed are iron hydroxide and basic iron carbonate. On further action iron oxide is produced and this is rust. The process of rusting is accelerated when sulphurous acid or hydrogen sulphide is present in the air in larger quantities and also when much salt is present in the water to which the iron may be exposed. The other process in the destruction of the iron although not quite so well known, is just as important and is the result of local electrical currents, the rust formation being due to electrolytical

Preparing a celluloid varnish or base for powdered metals such as aluminum and various bronze powders; this application dries very rapidly.



Benzol, kerosene and paraffine wax, the latter dissolving in the hydrocarbons gives a solution designed to prevent rust and oxidation of metallic surfaces.

destruction. The rapidity of rust formation in the latter case is sometimes astonishing and is caused by the presence of impurities in the iron itself.

There is very little that can be done to prevent the formation of rust in the latter case but quite a large number of ways are at our disposal to prevent its ravages under its former conditions. Tools and instruments are some of the common and every day objects which are affected quite easily by atmospheric moisture and many experiments are constantly being carried out for the better understanding of the influences governing the corrosion of all our metals. Steel instruments, especially, are very susceptible to atmospheric moisture and they rust easily if not in constant use.

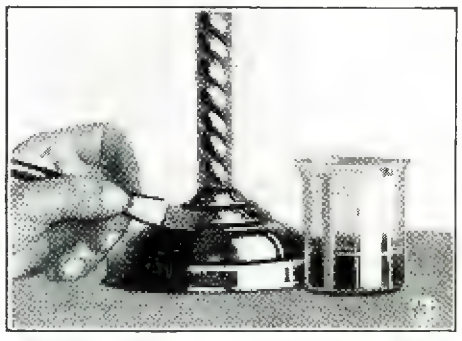
Smaller rusted tools and instruments may be cleaned and freed from rust provided the rust is not too deep nor too old, by placing them in a strong water solution of stannous chloride for about ten hours or until the rust has been sufficiently softened so that it may be readily scraped away. In this saturated solution of stannous chloride a process of reduction takes place which removes the rust. Then the instrument or tool is removed from this bath, washed in water to remove the salt and dirt which may be still present and then it is placed into hot soapy water to which a little sodium carbonate has been added. Wash it thoroughly in this solution and then dry. To remove the last trace of moisture the object is dipped and kept for a few minutes in a vessel containing denatured alcohol.

The prevention of rust, depends, primarily on the care that is given the object in question. The most simple way of preventing rust is to paint the iron with red lead mixed with linseed oil. But such a process is not feasible with tools. Here rusting is prevented by thoroughly oiling the instrument, which of course, must be free from rust, so that the air will not be able to come in contact with the metal, the film or oil, which does not evaporate, effectually sealing the metal from the air.

There is another way of doing the same thing. The metal is placed in a bath of benzol to which a little kerosene and a small piece of paraffin has been added. When this mixture, which may also be brushed, has thoroughly entered all crevices, the object is placed to one side and the benzol is permitted to evaporate. Keep all flames away from the benzol as it is highly inflammable. A hardly noticeable film will be left over the entire metal which will shield it from the moist atmosphere.

Iron piping and steam heaters, boilers and similar objects must not only be prevented from rusting but they must also be given a pleasing appearance. Here lead oxide salts play a large rôle but for radiators and piping running through the homes such a paint is not beautifying enough. Here a celluloid base is used by means of which finely powdered metals and metal alloys cover the offending eyesore. Such powders are known as bronze and aluminum paints and come in almost all colors. These are mixed, just before use, with banana oil. This so-called oil, consists of acetone, amyl acetate—which gives it its peculiar odor—and benzol mixed in equal quantities. To give body to this liquid mixture which is entirely volatile, a few chips of transparent celluloid are dissolved in the amyl acetate before it is mixed with the other liquids. until it forms a very thick and viscose solution. Then it is mixed with the other solvents. These powdered metal paints are very durable for indoor work.

Such metals as gold, silver and platinum are but slightly influenced by the atmosphere while the baser metals such as copper, lead and zinc or a combination of these soon show signs of change by their appearance. They tarnish which means oxidation takes place and the oxides of the metals are formed just as is the case with iron which oxidizes to iron oxide. Now



Painting with banana oil (amyl acetate) to prevent rust. This is not exactly a varnish yet it is quite effectual for brass.

the difference between tarnish and corrosion depends upon the depth of the oxidation. When it is slight, it is called tarnish, when the oxidation has been carried on for a long time and the deposit is thick, it is known as corrosion. There is little indeed that can be done under the latter condition but tarnish may be removed quite readily. It may be removed with an abrasive and elbow grease or by a chemical action. For brass, water, which contains acetic acid and a little salt, is used for its removal. For copper the same chemicals may be used and a very bright polish is provided at the same time. Oxalic acid in water cleans copper more rapidly but it does not impart such a bright finish.

Tarnish can be removed from copper by rubbing with a piece of cloth, moistened with oxalic acid dissolved in water. This is an old and very efficacious method. Do not forget however, that oxalic acid is a deadly poison; wash hands after using.

When the metal has once been cleaned it may be kept in its high lustre for quite a while when it is painted with banana oil which should be prepared as mentioned above. Here the oil itself is used. No metal powders are to be added when used for such a purpose.

www.americanradiohistory.com

A Magnetic Balance Ammeter

By WM. CAPUNE

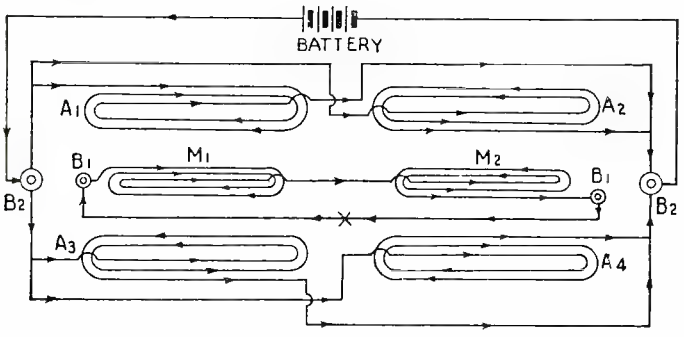


FIG. 1

Fig. 1 shows the wiring of this very sensitive ammeter. It indicates how the coils are to be wound so as not to counteract each other's action.

Fig. 2 gives diagrams of the general construction of the coil, and it will be seen how very delicate this operation will be because of the magnifying device including the long index needle. A common glass bead is used at each end of the shaft for the bearings thereof.

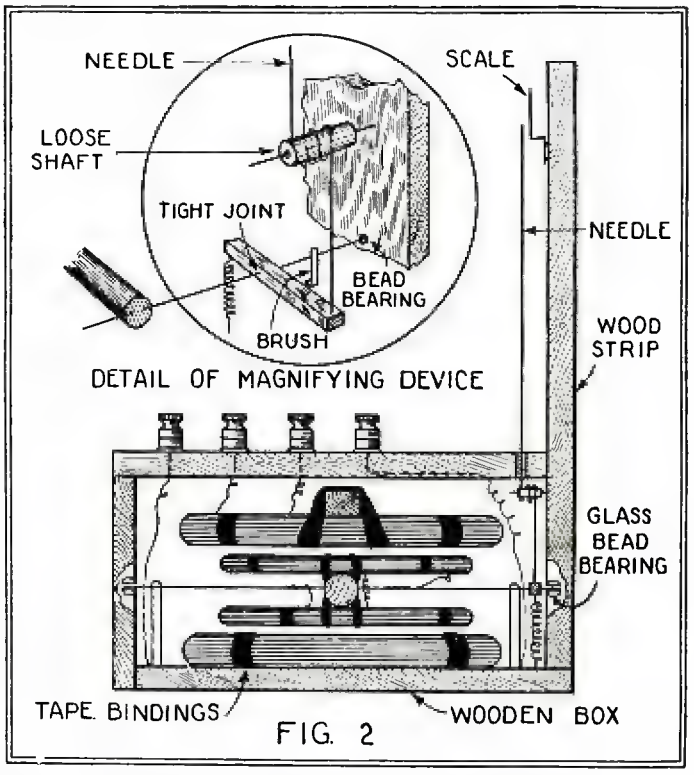


FIG. 2

AN instrument capable of registering very small currents and at the same time not likely to be damaged by accidental heavy currents is a hard combination to find, but the ammeter here described will be found to fill the bill very well. It is based on the principle of a magnetic balance being disturbed by induction from an external current.

The four balanced coils are made first and, since they must be exactly equal in their attractive power, the best way to make them is to measure out four equal lengths of wire tightly stretched between two nails. Each of these lengths is to compose one coil. Practically any size wire from number twenty to number thirty may be used, the lengths being cut long enough to form ten or fifteen turns in a coil of 1½" diameter. These coils should be made without any permanent internal support; a good way of holding them in shape is to bind them with silk thread or insulating tape.

With care these coils can be made very nearly alike. Then, in the actual assembling of the instrument they can be balanced exactly by interposing short lengths of resistance wire in series in the circuits of the stronger coils. The direction of winding and the connection of these coils is shown in the circuit diagram, Figure 1. The mounting is a wooden strip protruding from the end of the closed box containing the working parts of the instrument, as shown with open end as, Figure 2.

The moving coils must also be exactly equal, both as to magnetic power, and actual weight. They are made of about ten turns of the same size wire as the balanced coils, though the smaller sizes should be avoided unless the instrument is to be for the measurement of small currents only. These coils are made a trifle smaller in diameter than the first coils and mounted on a thin strip of wood, rather than metal, as the latter is more likely to affect the magnetic field.

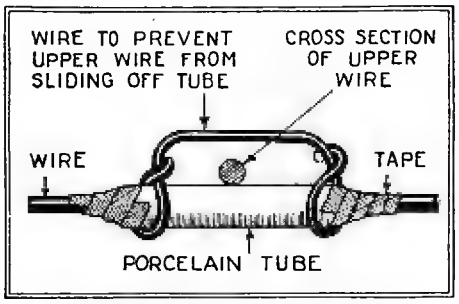
Through this strip needles are forced and the whole pivoted in glass beads sunk in the wood sides of the closed box. If a small drop of oil is placed in these bearings a nearly frictionless balance will be the result. The movable coils are made to balance and are connected in series as in Figure 1. Figure 2 shows the method of mounting the whole instrument and the magnifying system for the scale reading. The balanced coils are excited by some uniform external direct current, of moderate strength, say a dry battery.

It must be borne in mind if the instrument was calibrated with a certain strength of current in its balanced coils that for accurate readings the current must always be the same. If a very small current is to be measured, not in amperes but merely as to relative strength, better results will be secured by increasing the strength of the current in the balanced coils. The purpose of the four balanced coils is based on the fact that by this arrangement the magnetic force tending to rotate the needle is doubled.

Protecting Cross Wiring

By CHARLES F. FELSTEAD

WHEN outside wiring is being put up, the electrician will often have to cross several wires. The wires can usually be separated by a half foot or more; but if they are hanging from supports that are somewhat far apart, the upper wire is liable to sag, either from the weight of ice in winter or from the heat in summer, and to come in contact with the lower wire Since the wire used in outside installations is usually quite heavily insulated, no harm will be done if the wires are not allowed to remain in contact. However, if they are left touching for any length of time, the action of the wind will cause them to rub together, which will eventually wear through the insulations on the wires and cause a short-circuit. The wires may be protected from such an occurrence by slipping an insulating tube on the lower wire when it is put up. A simple and comparatively inexpensive insulating tube for the wire can be made from a six-inch long porcelain tube of the kind that is used for running wires through walls. The thick rim on one end of the tube can be easily broken away with a hammer. Then the porcelain tube can be slipped over the wire and fastened in the proper position by taping the ends of the tube to the wire, as shown in the illustration. A short piece of heavy insulated wire may be used to prevent the crossing wire from leaving the protecting tube.—*Charles Wing.*



A porcelain insulating tube is thrust over a wire crossed by another directly over it. This prevents wearing of metal or of insulation. An insulated retaining wire may be put on.

www.americanradiohistory.com

THE CONSTRUCTOR

Articles of Interest to the Home Mechanic

Efficient Searchlight for $3.00

Searchlight Made from Old Acetylene Automobile Headlight Projects 1½ Mile Beam

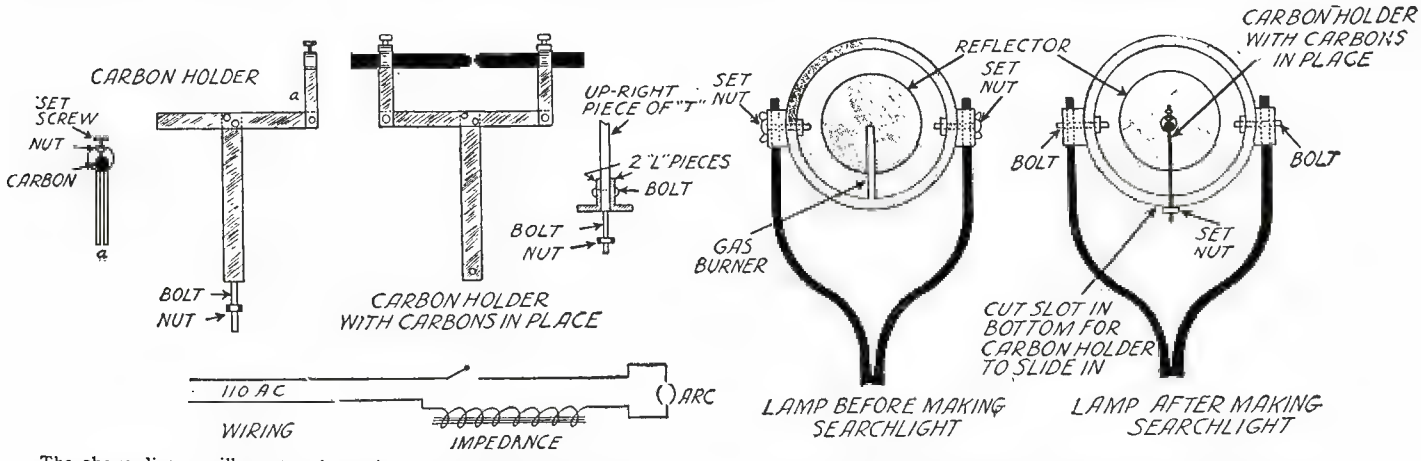
By CHARLES A. HALL

AN efficient yet inexpensive searchlight may be made by the average experimenter. This searchlight in recent tests has thrown a beam over a mile and a half long. The beam can be seen a good deal farther than that distance. The total cost of construction for the whole apparatus does not exceed $3.00.

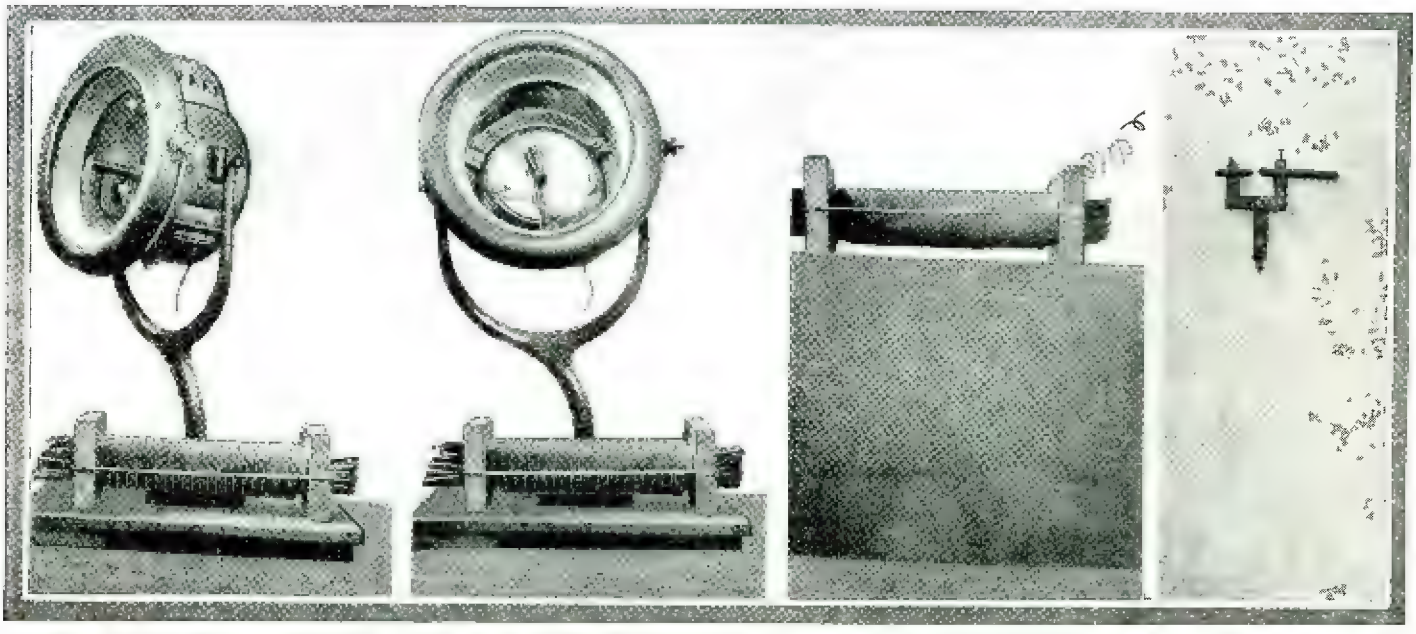
The first thing to do is to obtain an old acetylene head light sometimes found on trucks, as it is the glass reflector that we want. The writer paid 50 cents at the auto-wrecker's for his. Get as large a one as is possible to obtain. The light here described has a 6" reflector. Take the holder off the body of the lamp by unscrewing the set screw and sliding the lamp off the forked holder. Take out the glass that is in the front (as this will cloud up with smoke when the arc is burning) and the gas burner that sticks up from the bottom. Heat the forked holder and bend it apart enough so that when holes are drilled through the two ends and the sides of the lamp bolts can be put through and the lamp hinged. Next cut a slot three inches long by 3/16 wide in the bottom of the lamp as in the drawing. This is to take the carbon holder and is used for focusing.

We now have to make the carbon holder and means for adjustment. Cut two pieces of 3/16" brass strip 2½ inches long and put them together to form a "T," fastening them with two 8-32 bolts. Next cut two pieces of brass or copper stripping (1/32" to 1/16" thick) each 4¾ inches long and bend them so that they form a loop ½ inch across. These loops hold the carbons and should

(*Continued on page* 652)



The above diagram illustrates the various stages in the construction of this searchlight which operates on alternating current. At the left we see a view of the carbon holder further exemplified in the next illustration at the right which indicates the carbons in place. The third illustration shows the lamp before making the searchlight and the last illustration shows a completed searchlight mounted so that it can be pivoted and rocked up and down. One thing is suggested by this simple lamp—go to the automobile wrecker for supplies.



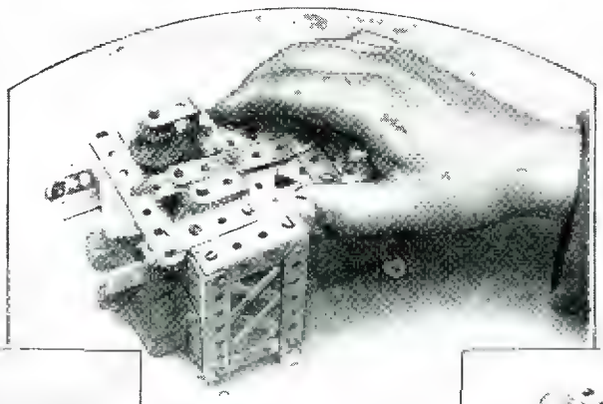
Above: View of searchlight and impedance. Another view of the completed light. The impedance coil employed here. The carbon holder.

www.americanradiohistory.com

Microscopical Instruments from Toy Constructor Parts

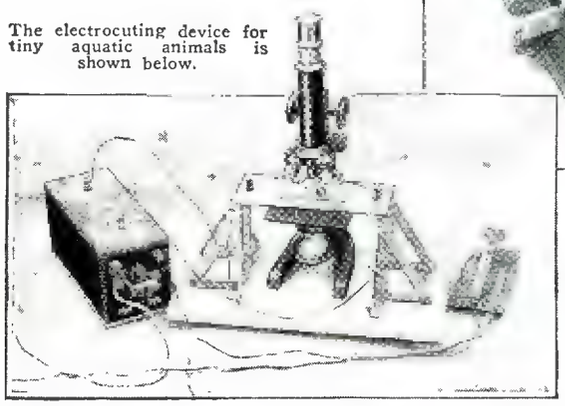
By DR. ERNEST BADE

IF one of the stronger toy construction sets is available, made from steel strips and brass gears which are cut and not stamped, such as are found in a meccano set, then rugged and strong precision instruments can easily be made. All parts made for such a set are interchangeable and can be used to good advantage. The gears are good and strong and mesh accurately, which is a prime consideration in the devices to be described. Such instruments, when bought in the open market are very expensive but when built at home with such a set no great outlay is required, for the parts may be taken apart when there is no use for them any longer and they may be quickly reassembled at any time.

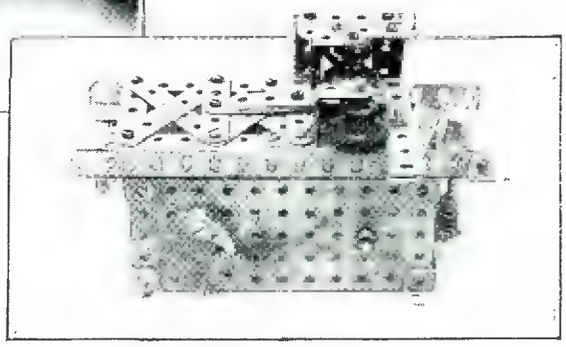


The slicing machine, which is used to cut very thin sections of tissues, is shown above. The animal or plant tissues to be cut are imbedded in a paraffin mixture and the razor blade is slowly moved forward with a sideways motion. This side motion cuts the object perfectly.

The electrocuting device for tiny aquatic animals is shown below.



Another view of the slicing machine showing the ratchet and blade appears below.



One of the simplest devices and one that can be built from almost any material is the electrocuting device for tiny aquatic animals. This consists of two standards fixed to a base board of non-conducting material such as wood. Across the top, a glass plate is fixed by means of two holes found at each end through which bolts are passed fixing it to the uprights. Through the center of this glass plate a larger hole is bored. (For glass boring machine see SCIENCE AND INVENTION for June 1925, page 162). Two wires from the spark coil connect with the standard and two wires from the standard go to the center of the glass. The object is placed on a slide, the microscope is adjusted and the key pressed when the animal is seen under the microscope after the spark distance has been adjusted on the slide.

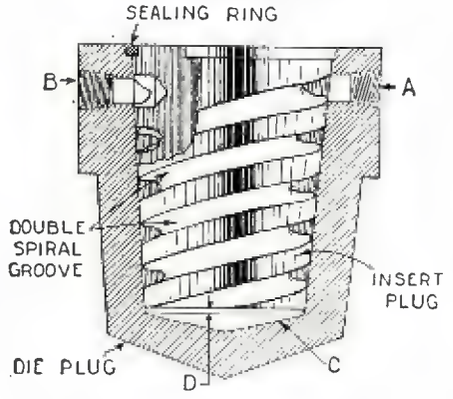
A real precision instrument is the microtome, a device for slicing off thin sections of plants and animal tissues. The tissues are imbedded in a paraffin mixture. A rod, running the length of the machine is slowly raised by means of a worm drive, a ratchet holding the worm in position. The other end of the rod holds a plunger which is slowly raised by means of the ratchet. The razor blade is fastened to the slide, and as it slides forward, a sideways motion is imparted to the blade by means of pinions and rack strips, two of which are used to hold the blade, and one at right angles to it to impart side motion. This side motion cuts the object with a perfect sliding motion permitting the cutting of exceptionally thin sections.

(*To be continued in the next issue*)

Hints for the Mechanic

HEATING A DIE PLUG

FIRST PRIZE $10.00



DIE PLUG HEATING DEVICE

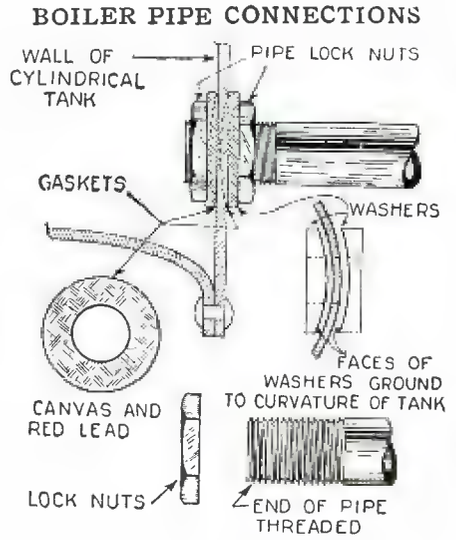
The above illustration shows clearly the method of heating a die plug.

In order to heat a die plug, the plug must be cut on a taper and an insert plug then matched to fit this tapered bore. On the insert plug a double spiral grove is cut. The two plugs are then fastened together and sealed as shown. An inlet connection is made at A and an outlet pipe connection at B. The plug can be cooled by allowing cold water to flow through the grooves in place of steam. The taper surfaces should fit snugly.—*John Wynd.*

A New Department

BEGINNING with the May number we started this new department—"Hints For the Mechanic," in which we intend to publish wrinkles useful to mechanics in general. You can help us with this department by writing a brief description of your favorite shop wrinkle and sending this to the editor of this department, together with a pencil or pen and ink sketch of the wrinkle. The ideas published herewith will give you some idea of what we want. Our draughtsmen will make the necessary mechanical drawings, so you need not send us finished drawings. We will pay $10.00 each month for the best Wrinkle or Hint sent in; others published will be paid for at space rates. Address all letters to Editor, Hints For the Mechanic Dept., in care of this magazine.

BOILER PIPE CONNECTIONS



Joining pipe to a thin cylindrical tank.

Providing a pipe connection in a tank which is too thin to tap, may be accomplished by two washers, ground, curved on one face of each.—*G. A. Luers.*

(*Continued on page 674*)

www.americanradiohistory.com

HOW TO MAKE IT

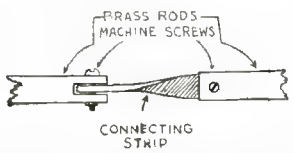
BARBED WIRE FENCE HINT

When it becomes necessary to negotiate a barbed wire fence, and one desires to avoid the expense of a gate, it is a good plan to adopt this hint.

Two of the center wires are detached and over these are slipped short lengths of ordinary rubber garden hose. One now finds that it is a simple matter to pass quite safely through the fence without risking danger to clothes.—S. Leonard Bastin.

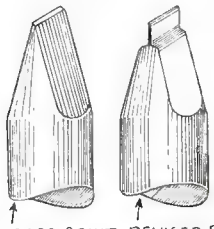
A SIMPLE UNIVERSAL JOINT

The accompanying illustration shows a simple universal joint that can be very easily and quickly constructed. Here it is shown joining two ¾ inch diameter brass rods.



The connecting strip is a piece of 3/8th inch brass, 1 inch long and 1/8th inch thick, twisted as shown, and held in place with round head machine bolts. Burr the screws so the nuts won't come off.—Charles F. Felstead.

SCREW DRIVER POINT

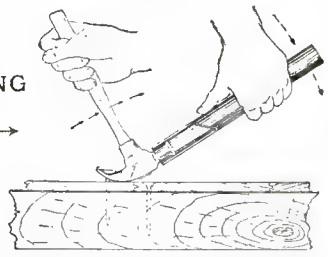


Screw drivers with tapered points frequently slip out of screws and tear away the slot. If the screw driver is ground with the flat surfaces parallel for about a quarter of an inch, many of the dangers will be eliminated.—Peter Hagen.

DIVIDER HERMAPHRODITES

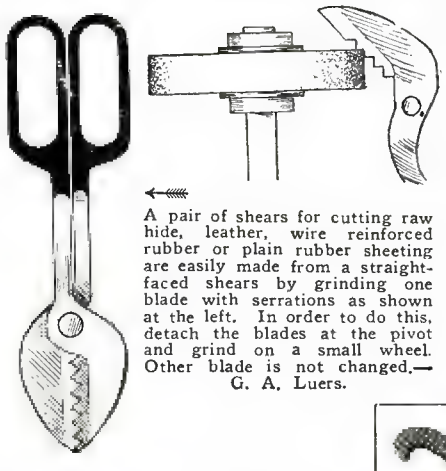
Large dividers can be made into good hermaphrodites as shown in the above photo. The end of an ordinary clothespin is stuck on one point and it gives the free point a better chance of hitting the same arc each time it is located at a different point for scribing.—Frank W. Bentley, Jr.

NAIL PULLING AID



It frequently happens that when a man has to pull nails four inches or longer, the job is very difficult and many a hammer handle is broken. With the aid of a piece of pipe, fitted over the hammer as shown, one need not bet the price of the hammer handle against the nail.—William Wright.

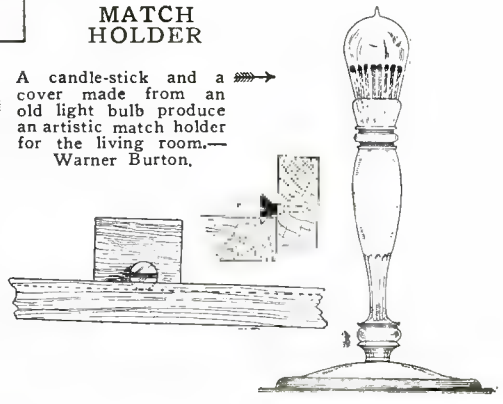
SHEARS FOR LEATHER



A pair of shears for cutting raw hide, leather, wire reinforced rubber or plain rubber sheeting are easily made from a straight-faced shears by grinding one blade with serrations as shown at the left. In order to do this, detach the blades at the pivot and grind on a small wheel. Other blade is not changed.—G. A. Luers.

MATCH HOLDER

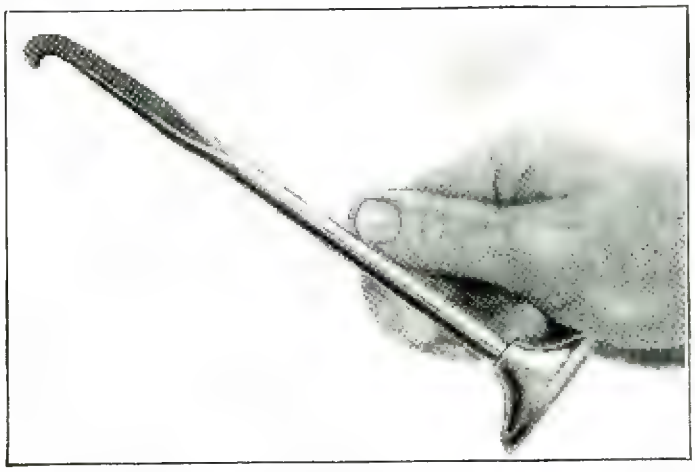
A candle-stick and a cover made from an old light bulb produce an artistic match holder for the living room.—Warner Burton.



BEAD PLANE

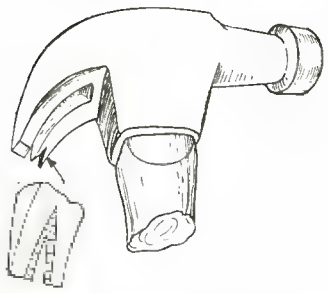
A make-shift bead plane can be produced from a block of wood into which a large flat-headed screw is driven. The distance regulates the size of the beading. When sandpapered, it will pass muster on almost all jobs.—Harry Schmidt.

A REAL HOOK



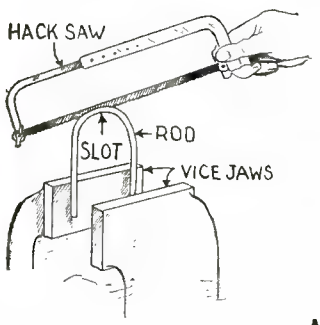
A very handy tool is produced from an old tractor valve in the manner indicated in the above photograph. The stem of the valve is cut off at the cotter pin hole and drawn out. The article can be gripped between the fingers better than a loop or eye handle and can even be picked up with gloves or mittens on.—Frank Bentley.

HAMMER IMPROVEMENT



A very practical improvement to a hammer is a small claw filed in one of the two sides of the nail claw as shown above. With this it is possible to start nails which have been driven close.—F. B. Lindsay.

TO CUT SLOTS



Usually the cutting of a slot in a rod or a tube is quite a difficult job. If the rod is bent on itself as indicated, then clamped in the jaws of a vise, a hacksaw can be used for cutting the slot.—H. Felder.

www.americanradiohistory.com

Readers Forum

SCIENCE AND INVENTION desires to hear from its readers. It solicits comments of general scientific interest, and will appreciate opinions on science subjects. The arguments pro and con will be aired on this page. This magazine also relishes criticisms, and will present them in both palatable and unpalatable forms. So if you have anything to say, this is the place to say it. Please limit your letters to 500 words and address your letters to Editor—The Readers Forum, c/o Science and Invention Magazine, 230 Fifth Avenue, New York City.

ASTROLOGY VIA PALM

Editor, SCIENCE AND INVENTION:

I have been a very interested reader of your fine magazine for over five years and have paid particular attention to the Readers Forum Department, and have at last occasion to ask a question through this department.

I have followed very closely your articles on Astrology, and have been convinced by them that Astrology has no scientific fundamentals and therefore cannot be classed as a science.

But, the other day I had occasion to be in the presence of a practicing astrologer, by whom I was requested to give my birth date and also ask a question regarding myself. The question which I asked was: Would I be successful in the line of work for which I was studying?

Now, mind you, this astrologer had never seen me before in her life, yet from a look at my hand she informed me that I would be successful in my line, and also that I was studying to be an architect.

Now, as a matter of fact, I am studying Mechanical Drafting, which certainly has a close relationship to an architect. This struck me that she had made an uncanny accurate guess, yet your magazine convinces me that Palmistry and Astrology are all hokum. Then, I wish you would tell me how this woman was able to inform me so accurately what my profession was going to be.

Just a word for your fine magazine, I think it is one of the best scientific papers published and throughout the five years that I have known it, I have enjoyed it immensely.

FRANK RHODES,
Sherbrooke, Que., Canada.

(You point out several peculiarities in your communication. In the first place, it is not customary for an astrologer to look at a person's palm in order to tell him what his future business will be. It is for the palmist to do this. In the second place, palmists do not tie up astrology with their method of operation. The party you visited was evidently making use of both systems in trying to predict your future.

Now, as to why the astrologer was able to so correctly guess your forthcoming vocation. This is a question difficult to answer. It may have been one of a dozen guesses which this astrologer made and at which the correct solution was derived. Just for example, suppose all of the readers take out their pen or pencil now before proceeding further with this answer. On a slip of paper write down the name of a color. Then immediatly under it, the name of a flower and then following that, any number between 1 and 10. Do not read any further for the moment, but complete this test; then turn over the paper. Be fair with yourself because the editor is miles away from you and he cannot see what you have written. Now here is our answer. The flower is rose, the color red, and the numeral 7. Just check this with the figures you have placed on a sheet of paper and see how nearly correct we have been. Yet we have used no astrology, we have used no clairvoyance, we have employed no tricks of palmistry or magic. We have simply based our answer on the law of averages and unless you deliberately tried to fool us, the chances are that we have been 66 2/3% correct. The palmist may have had something to guide her when she hazarded the guess. Perhaps a little hardening on the tips of your fingers or the presence of India ink meant something to her. Perhaps this was merely one guess out of a dozen. The fact that she did not strike the nail on the head and give the correct answer proves that it was a guess. It is just as bad to miss a target by an inch as it is to miss it by a foot.

Thank you very much for your kind compliments.—EDITOR.)

A BOUQUET WITH A STING

Editor, SCIENCE AND INVENTION:

I am a new reader of SCIENCE AND INVENTION Magazine and buy it for this reason: When I first bought a copy I was glad to see that it was filled with long interesting articles, instead of short articles on new inventions, which seem to me to be the substance of most American magazines. I find the Experimental Chemistry pages interesting and may I suggest that Sulphuretted Hydrogen apparatus (described on page 239 of the July number) may also be used for generating hydrogen by placing zinc in the flask instead of iron sulphide. It is an advantage that SCIENCE AND INVENTION is now on sale over here as, to the best of my knowledge, no cheap magazine like it is published at home. Now, I have one serious criticism to make. Why is it that advertisements and reading matter are mixed up?

On opening the July number I began to read "Tales From The Scientific Club" and found that it took up six columns amongst the avertisements. Similarly with "What Is Matter?" The illustrations were on one page and the explanations on another. Can't you remedy this? Perhaps some people bind their copies, but they do not want to bind in advertisements.

I am glad to see, however, that this does not happen in "Amazing Stories" and they can be bound if required.

MALCOLM E. HUMPHERY,
Perthshire, Scotland.

AMAZING STORIES

IN THE NOVEMBER ISSUE

TREASURES OF TANTALUS (Conclusion), by Garret Smith. Though Professor Fleckner's telephonoscope bids fair to act for the public good, because of its ability to penetrate the thickest walls and look into the most submerged hiding places and so unearth a gigantic criminal trust, avariciousness, with the help of newer and cunning devices, throws the world into panic and a veritable reign of terror. This well-known author makes the most out of the various developments of the plot and intricacies and gives us a tremendously interesting conclusion to an unusually good scientifiction story.

THE ASTOUNDING DISCOVERIES OF DOCTOR MENTIROSO, by A. Hyatt Verill. This, no doubt, is the story of the year. Our well-known author is delving into the realm of time in this most absorbing story, and before you get through reading it your head will be in a whirl. What is the past? What is the present? Can we step into the future? Can you witness something now that happened yesterday, and can you actually see something that is going to take place tomorrow? Dr. Mentiroso shows you how it is done, backing it up by the best of reasons and scientific facts that you will not be able to refute. Don't fail to read this story.

A STORY OF THE STONE AGE, by H. G. Wells. Our famous author has gone back to the stone age and develops a picture before your eyes that is most astounding to our present-day experience. Yet there is no question that the things that Mr. Wells speaks of must have existed in the far gone age when man was still young and not much more than an animal. If you ever wanted to know what your great-great ancestors were doing in their day you positively must read this story.

THE MACHINEMAN OF ARDATHIA, by Francis Flagg. If the human being continues to progress, mechanically, at the rate of speed at which we are progressing now there is no reason to believe that we might not eventually evolve into veritable "machine men." What such an existence might be like, is graphically told in this story. Whether such a life would please you, is another question.

(SCIENCE AND INVENTION Magazine carries advertisements in conjunction with text because the advertising columns are worth more to the advertiser that way than if they are remotely separated from the text. Each issue of SCIENCE AND INVENTION costs more to print than it is sold for, and it therefore is necessary that the additional revenue be made up in some way, which is generally derived from the advertising income. Therefore, we really must be excused for slightly inconveniencing some of our readers.

On the other hand, we have found that a great many readers read the advertisements with keen interest. Advertisements are a source of information which is frequently lacking from editorial material. We know many readers who read the advertising columns of this publication first, even before they examine the editorial content. We thank you very much for your suggestion to employ zinc and an acid in the gas generator. We are glad to pass the information along.—EDITOR.)

MISSISSIPPI FLOOD PREVENTION

Editor, SCIENCE AND INVENTION:

Allow me to submit my idea to conquer the Mississippi River.

Say we build a flood gate, a certain distance inland from the mouth of each river that flows into the Mississippi. These gates would be open at all times, and in case of a threatened flood, these rivers could flow until they swell the Mississippi to a danger level. Then close the gates, giving the Mississippi a chance to run to a lower level. Now, as the backwater of these rivers swelled to a danger level, the Mississippi should be in a condition to receive more water. Then these gates could be opened at intervals, only when that particular river rises to a danger point, due to backwater. Now, in case the Mississippi could not take care of this water by this time the only sensible thing to do in this emergency would be this: Let a certain amount of water overflow along these rivers which would spread over such a vast area of land that the loss to property would be little or none to speak of. This idea would not only save the Mississippi; it would save having to flood one community with untold loss to life and property.

HUGH BOWERS,
Houston, Texas.

(The first suggestion which you make to prevent the overflowing of the Mississippi River is not very practical, as the number of flood gates necessary would be terrific and the flooding of vast areas would not be prevented. Not only does the river swell, but all of its tributaries swell at practically the same time. Therefore, stopping the flowing of water from the tributaries of the Mississippi River, might relieve to some extent the danger of a Mississippi flood, but this relief would be very limited. A simile might be likened to the shutting off of flow from a 2 inch pipe into a 10 foot sewer. Each tributary would resemble the 2 inch pipe and the Mississippi itself would be similar to the drain 10 feet in diameter. It is quite obvious that the individual tributaries have but little effect singly, but if combined would develop a monstrous force. It is also questionable whether flooding one area to a considerable depth will result in greater damage than flooding large areas to but a few inches. Perhaps more people would suffer in the latter case than in the former and it is just as possible that much greater damage to crops and land would result in the latter case.—EDITOR.)

PSYCHOLOGY

Editor, SCIENCE AND INVENTION:

In the June issue of SCIENCE AND INVENTION you handle Astrology and Spiritualism in no uncertain terms. Congratulations.

But will you extend your investigations into the realm of psychology, and will you be as frank to criticize the theories now advanced? Will you give this field your attention in the near future?

Many of us would like to have conclusive evidence, whether or not the mere animal is capable of reasoning and could ever become accountable. Whether the ability to reason depends upon the size, quality, or structure of the brain. Whether the brain does the thinking. Whether man differs from the mere animal in degree only, or whether he also differs in kind.

Psychology as now taught fails to answer these points satisfactorily. Spiritualism, astrology, theosophy, and even theology fail utterly.

So now, what have you to offer? In all sincerity, yours

DR. J. E. BARTEL, PHYS.,
San Francisco, Calif.

(There are of course many differences of opinion as to whether or not animals are capable of reasoning. Most scientists will claim that an animal acts by instinct, yet we have seen a rabbit trying to get out of the way of a bird of prey and this rabbit would dodge back and forth beneath a single barbed wire or barbed wire fence, knowing full well that the bird could not get through the wires, and that while it was on the far side of the wire the rabbit was fairly well protected.

Is it instinct for those famous theatrical dogs to actually speak 11 words in German so that their words are recognizable? Is it instinct for a police dog to jump into the waters of the bay to save his drowning master—we wonder. And yet, we cannot call this reasoning.

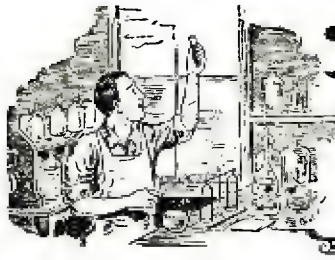
Probably the ability to reason depends not on the size or on the quality of the brain because both size and quality may be identical in two individuals, one of whom might be internationally famous and the other an idiot. The structure?—perhaps. It might be a preponderance of association fibers. It might be an extraordinary development of the pyramidal cells or even something about which we know nothing.

Undoubtedly the brain does the thinking as a result of various stimuli obtained from other portions of the body because if various parts of the brain are absent, thinking is considerably distorted. Other parts of the brain are directly associated with movements and if these are destroyed, those movements or those senses are absent.

As to your last question, we leave that to be answered in the future by others who will then be more versed in psychological knowledge than those of the present generation.—EDITOR.)

(*Continued on page 670*)

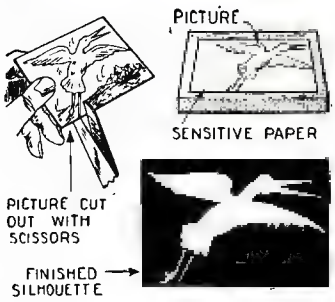
www.americanradiohistory.com



WRINKLES
RECIPES & FORMULAS

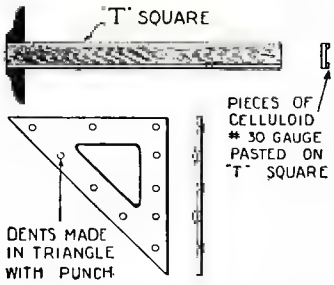
Edited by S. Gernsback

SILHOUETTE PHOTOS



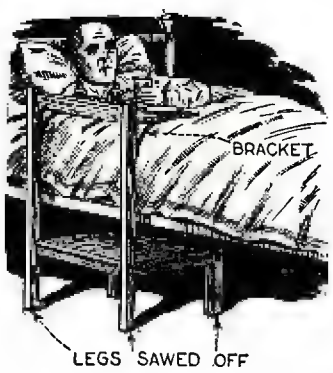
Beautiful and artistic silhouette photos may be made as follows: Cut out the outline of a picture and place it on sensitive photographic paper. Expose this for some time and then develop and fix in the usual manner. These silhouette photos are easy to make and many attractive combinations can be obtained. Almost any drawing or picture may thus be produced—M. Zaretian, Reporter No. 25518.

DRAFTSMEN'S AID



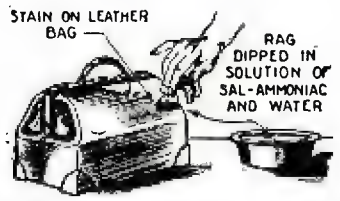
In making pencil drawings on white paper, difficulty is usually experienced in keeping the paper clean. If a piece of celluloid is placed on the triangles and "T" squares as shown, this difficulty will be eliminated. Another method is to make dents with a punch on both surfaces of the triangle. This will keep most of the surface contact off the paper.—L. B. Sklar.

INVALID TABLE



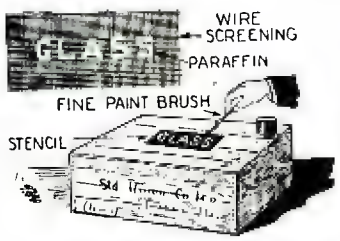
An old chair, with the legs sawed off as shown, may be easily pushed under the bed and an invalid table made in this manner. A smooth piece of wood is fastened to the back of the chair.—Vernon Miller.

BAG CLEANER



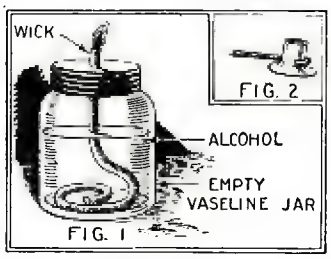
A cleaner for leather bags may be made with a solution of sal-ammoniac and water. Contributor send name and address.

WOOD STENCILS



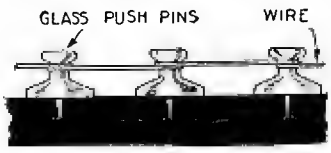
Stencils suitable for marking wood are easily made from a piece of wire screen.—T. F. Rowe.

ALCOHOL LAMP



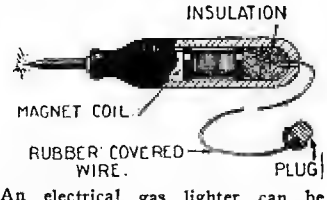
An alcohol lamp can be made from an empty vaseline jar as shown.—J. A. Wiederhold.

GLASS INSULATORS



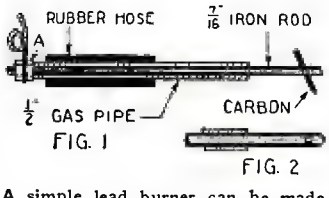
Glass push pins may be used as insulators.—D. Pollack.

GAS LIGHTER



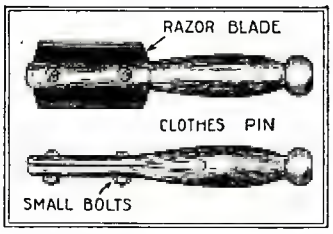
An electrical gas lighter can be readily made as shown. This is wired directly to one side of the electric line and when the point touches a gas fixture, it grounds, and a spark is produced.—Leslie Carpenter.

LEAD BURNER



A simple lead burner can be made from a few parts as shown. Fig. 2 shows the method in which the rod is split in order to admit the carbon.—G. L. Robins, Reporter No. 24958.

RAZOR BLADE KNIFE

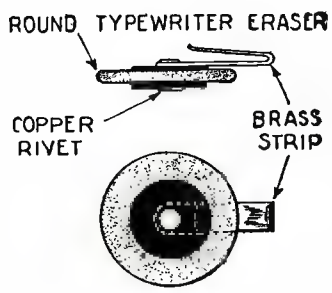


A wooden clothes pin, the prongs of which have been narrowed down, serves as an excellent handle for a razor blade. The blade is held in place by two small bolts. A knife of this sort is very handy when cutting cloth or paper, and a number of them can be made at a negligible cost.—D. S. Jenkins.

TRICK TOBACCO

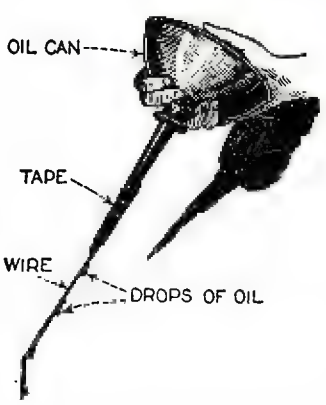
If you know a chronic tobacco-borrower hand him a tin of this super-smoking mixture. Soak the tobacco in a solution of saltpeter, dry it thoroughly and pack it back in the tin. There is no danger. Everything that happens, happens right in the pipe. The tobacco should be thoroughly dried before it is put back into the container.—J. H. Byers.

ERASER KINK



A clip of brass riveted to an ordinary round eraser will prove very useful. An eraser fixed in this manner can be clipped onto the frame of the typewriter and will be found within reach at all times. It is especially valuable on portable machines, as it in no way interferes with the closing of the typewriter.

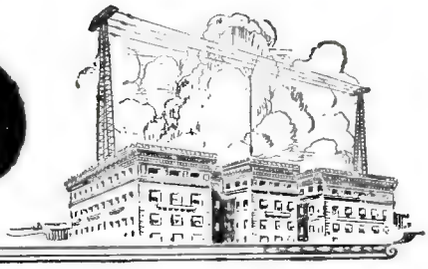
OIL CAN EXTENSION



A piece of wire attached to the tip of an oil can as shown, will enable one to lubricate out of the way places easily.—R. E. Steck, Rep. No. 27055.

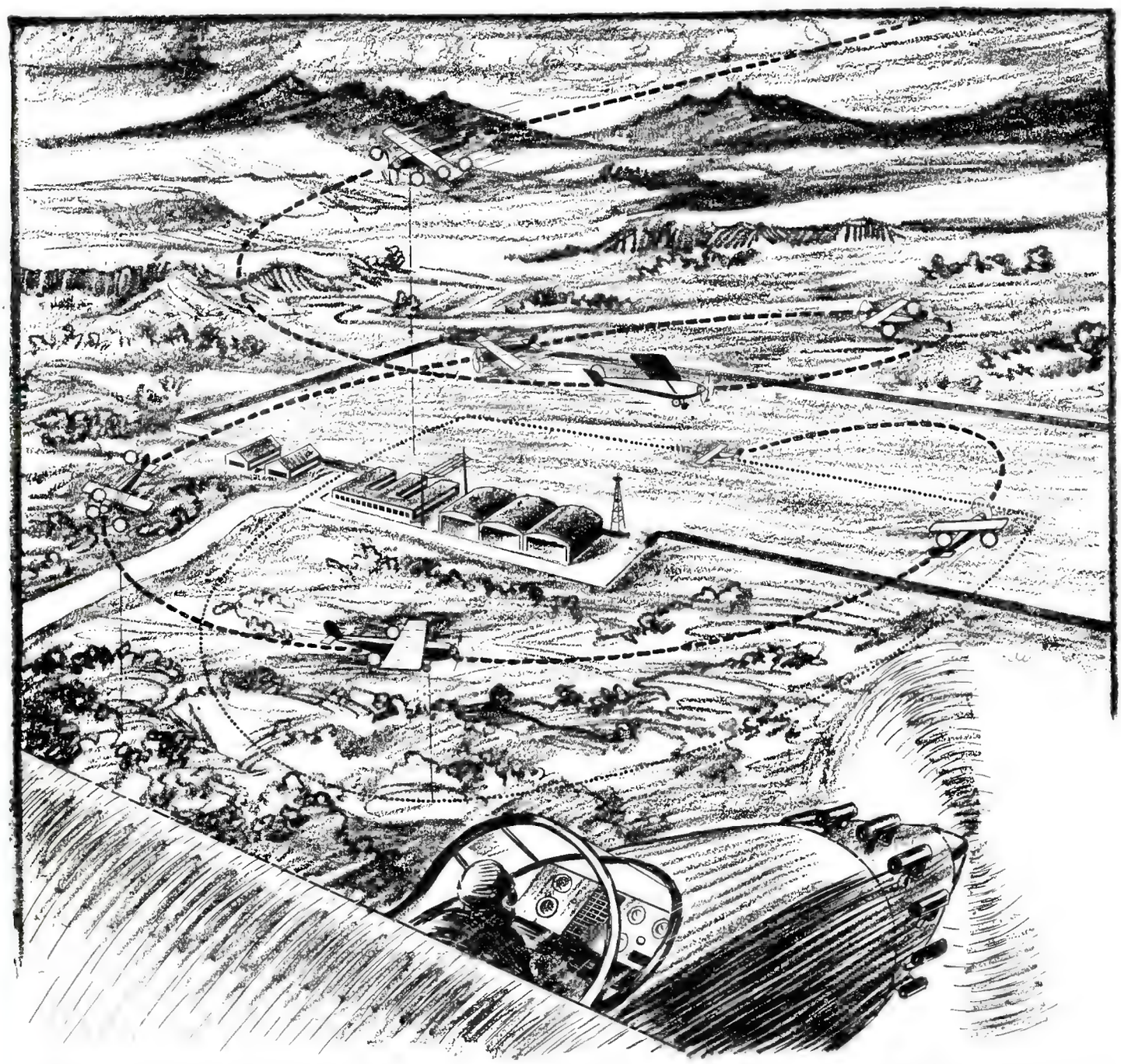
www.americanradiohistory.com

RADIO



Radio "Hand" Helps Planes to Land

Aviators Enabled to Find Field at All Times



Radio frequency current has been used many times in directing ships, but a new use for this radio or high frequency current appears in the German magazine *Die Koralle*. The above drawing should help to make this clear. A cable is placed beneath the ground, around the borders of the airplane landing field, and a radio frequency current is then sent through it. During foggy weather or at night, when a landing cannot be made because the field is obscured, an arrangement of this nature should prove to be a great help in all airports.

A bank of small lamps are placed on the instrument panel of the plane. These lamps are actuated by the radio frequency current and glow in response. If the pilot deviates too far to the left of the cable, three lamps light on the left hand side of the bank and one on the right. When the plane is directly above the cable carrying the radio frequency current, one lamp lights on the left and one the right. These lights are shown in the above illustration by the small white circles on either side of the plane. Again radio helps the aviator.

www.americanradiohistory.com

Radio "Guard" Watches Water Supply

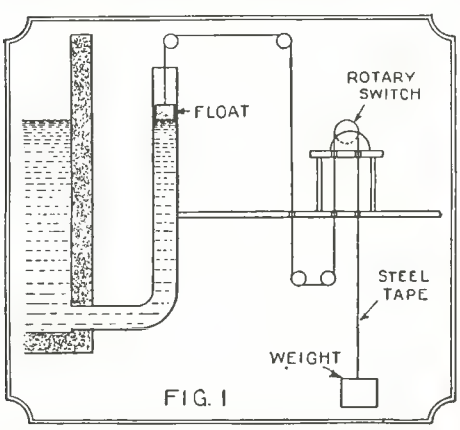
Reservoir Level Transmitted Automatically Each Hour by Radio

By WALTER E. BURTON

The switch above controls the transmission disks and is governed by a water level float.

WHENEVER the city of Akron, Ohio, takes its Saturday night bath, or waters its lawns, the fact is broadcast to the world through an automatic radio station. A radio station plays watchman for the water supply. Every hour it transmits the water level in the city reservoir, so that the operators in the pumping station, fourteen miles distant, may know how to regulate the water flow.

Both the sending and receiving operation of the radio system are automatic. Master clocks, set frequently by time signals, operate the equipment. At about eight minutes to every hour the receiving set at the pumping station is turned on, a red light informing the attendants of this fact. The set remains in operation for five minutes. At five minutes to the hour the sending station automatically goes on the air and broadcasts the water level, the operation requiring about fifty seconds.

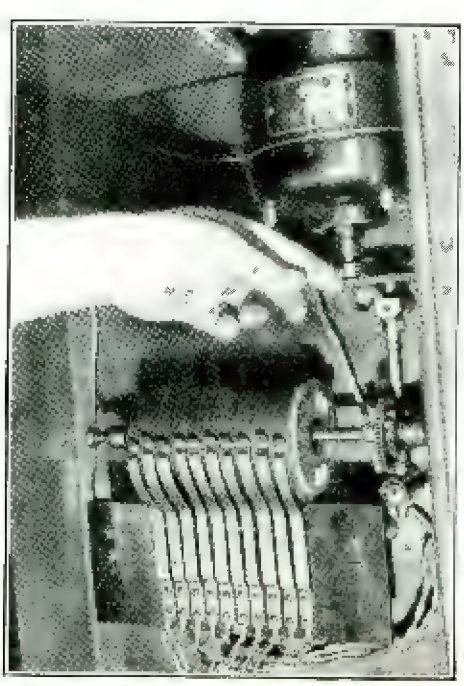


The schematic diagram of the movable steel tape system is shown above. The rotary switching device may be seen in detail in Fig. 2. Note the float operating in a perpendicular pipe.

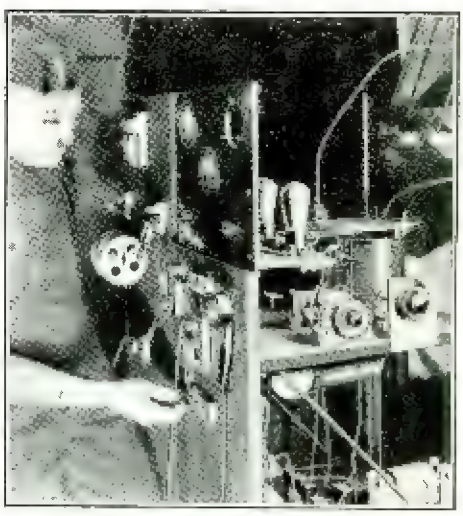
The water level recording apparatus is unique. A float, operating in a pipe according to the water height, moves a perforated steel tape which is connected to a switching device resembling a Ford timer. This is merely a ring built up of alternate sections of brass and insulating material. A contact arm operates on the inner surface of the segments, touching one at a time. Each of the brass sections is electrically connected to a spring contact arm which rests on a hard rubber disk. When the station is sending, the disks rotate, and alternate elevations and depressions on their edges operate the contact arms as if they were telegraphic keys. The combinations of dots and dashes on a disk forms the signal in wireless telegraph code. There are 11 different signal combinations which give readings with increasingly greater accuracy as the water approaches the top of the reservoir. The closest reading is within 1½" of the top, the next is 4½", the next is 7", etc., until the maximum of 9' 2" is reached, then the apparatus repeats. The sending station may be used for voice communication by merely switching a microphone into the circuit instead of the buzzer which is employed to produce the signal.

Wm. Manfrass, inventor of the system described here, is shown with the clock controlled radio receiver. The clock at the upper right-hand corner controls the radio set.

The receiving equipment consists of an ordinary short- wave three-tube regenerative set. The master clock which operates it is situated on the meter panel above the station supervisor's desk. Signals through the loudspeaker can be heard all over the station.

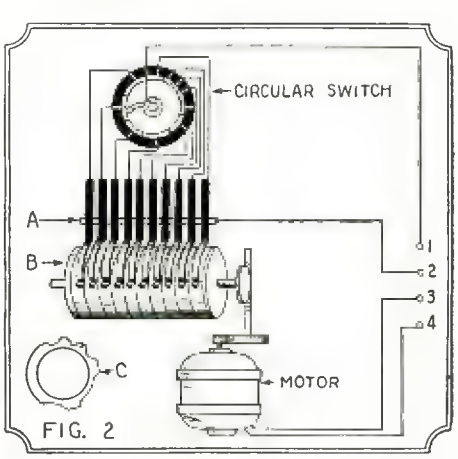


Hard rubber disks, rotated by an electric motor, produce the signal. Above, we have a photo showing the apparatus which also appears in Fig. 2. Each of the contact arms is connected to a segment of the rotating switch.



The above photo shows a view of the transmitting apparatus in the reservoir attendant's home. The installation consists of a 15 watt transmitter of standard design, operating on 175 meters. The station call is 8OIC.

The cost of the complete radio installation was less than $500, and it has operated since January, 1926, without failure, and with no upkeep cost except the occasional recharging of batteries. Waterworks officials have estimated that the equipment has paid for itself several times in the amount of coal saved, besides the additional convenience and reliability. The constant check of the reservoir water level enables the pumps to be operated at a more uniform rate, with a resulting economy in fuel.



The rotary switching mechanism and the rotating disks are shown here. C shows a cross-section of one of the rubber disks. The wires 1, 2, 3, and 4 are connected to the automatic transmitter.

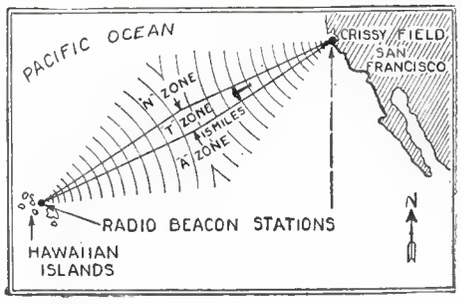
Before the installation of the present communication system, the reservoir attendant telephoned to the pumping station two or three times a day in order to announce the water level. It often happened that storms, ice, and other interruptions cut off the telephone service. As is usual with such things, these accidents occurred during the most disagreeable weather, and the attendant was forced to jump into his car, drive to Kent through a blizzard or rainstorm.

www.americanradiohistory.com

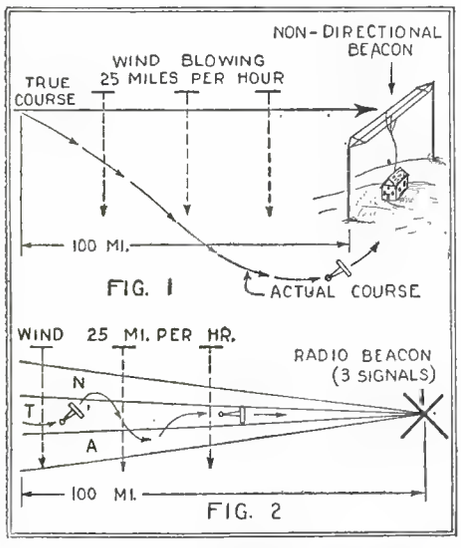
Pacific Fliers Led by Radio Beacon

Three Radio Signals Broadcast by the Beacon Kept Aviators on Course

DURING the World War radio was used to some extent for aiding aerial navigation, both by the Allies and the Germans. Two methods were in use, but both required the services of a specially trained operator and navigator. It is quite obvious that such equipment would be inadvisable for use, either on smaller aircraft, where the pilot would be required to operate the set, or in larger planes, such as the G-2 on the Hawaiian flight which are so heavily loaded as to preclude carrying weighty and complicated radio apparatus, and an additional man as an operator. Therefore, the present system of directional transmission was devised by the Material Division of the Signal Corps Radio Laboratory, so as to eliminate the necessity of all special receiving equipment on the plane, thus simplifying the installation as well as the operation.



A stream of three signals were sent out from the beacon stations as shown above. When the aviator deviated from the "T" zone, he was apprised of the fact by hearing the Morse letter "N" or "A."

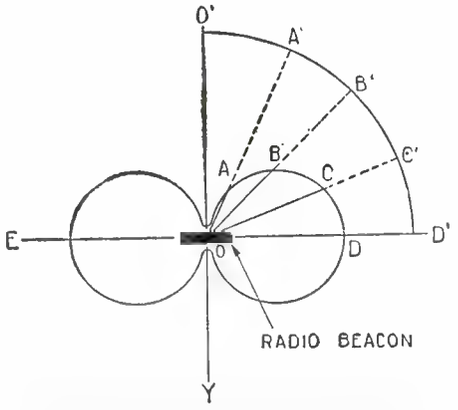


The diagram above shows how wind drift is eliminated by using a radio beacon.

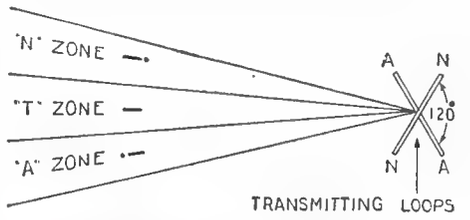
For the Hawaiian flight, two radio beacon stations were erected, one at Crissy Field, California, and the other at Paia, on the Island of Maui, Hawaii. The antenna consisted of two triangular loops, erected at an angle of 120° to each other. These loops were 72 feet high and had a base of 300 feet. The station was capable of transmitting signals along any desired compass bearing by means of a radio goniometer, which was connected to the large outside loops. The goniometer is a coupling device which is used for obtaining the proper current relationship of each loop, by means of which the resultant field may be shifted at will. In following the course, it was only necessary for the operators to tune in on the beacon wavelength of 1030 meters, and keep the plane headed in the course upon which the Morse letter "T" was heard, at about three-second intervals. If their course deviated to the North, the letter "N" was heard, and if to the South the letter "A". The width of the course upon which the "T" signals were heard broadened at the rate of about one and one-half miles in 100. This made the maximum width of the San Francisco station 15 miles in mid-Pacific, at which point the two beams overlapped or converged.

With the employment of the radio beacon it is not necessary to rely on either the earth inductor compass or the master compass, except to use the compass for maintaining a line flight to prevent unnecessary zig-zagging across the width of the "T" zone. The radio beacon follows the shortest path, or great circle course, and the only navigational corrections made throughout the flight were those for checking the value of the compasses.

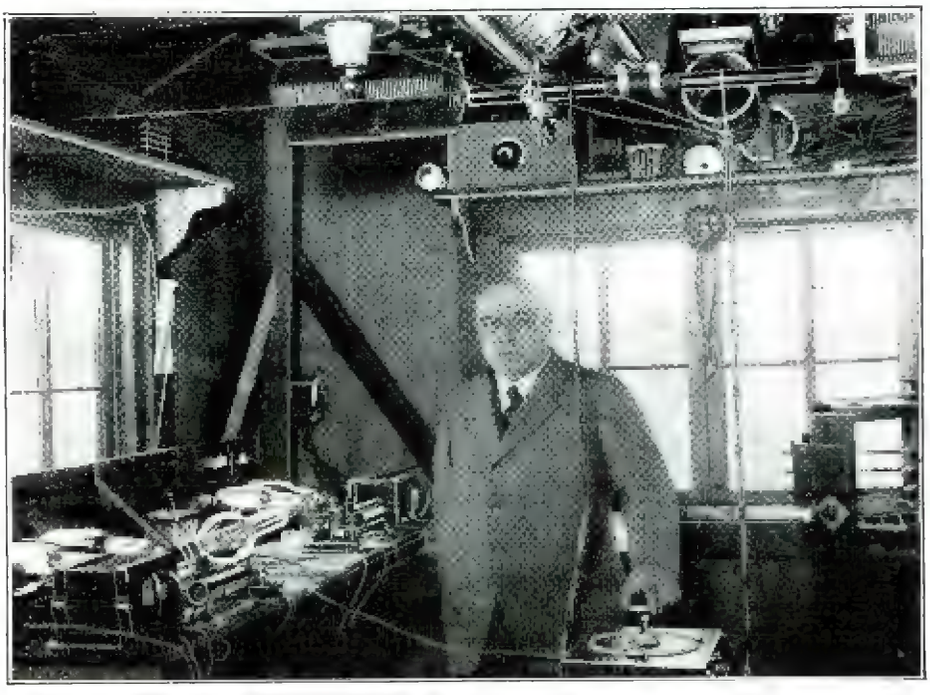
On one loop the Morse letter "A" was sent out, as shown in the diagram, consisting of a dot, space, dash, and on the other loop the Morse letter "N" was sent out, consisting of a dash, space, dot. By means of a suitable keying device, and loop relay, the alternate parts of the two Morse signals were interlocked so that the spaces were the same length as the dots. The result of this was that when flying along the signal zone, that is the correct line of flight, the "A" and "N" merged into a dash, or Morse letter "T" which dissolved into a dot, dash on one side, and into a dash, dot on the other side, whenever the plane varied from its correct course. The radio beacon is also useful in guiding aviators through night, fog, or rain, and will also obviate the necessity of celestial observations throughout flight.



The directive transmission characteristics of a coil antenna may be seen in the above diagram.



Two loops, placed at an angle of 120°, were used as beacons in the Trans-Pacific flight.



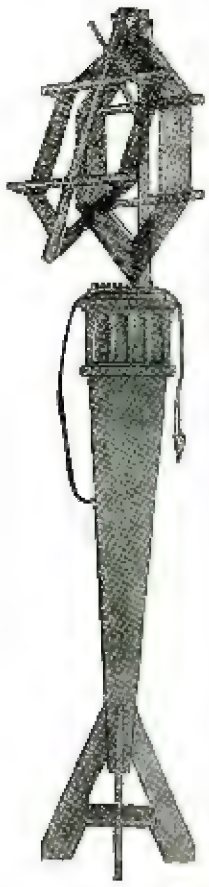
Above is an exclusive photograph showing Dr. Geo. K. Burgess, director of the U. S. Bureau of Standards, and the aircraft beacon at College Park, Maryland, designed for guiding planes by radio. This is the first radio beacon for use in civil aviation and is but a forerunner of 40 other similar installations to be established at 200-mile intervals.

The drawing appearing at the top of the page shows the location of the radio beacons and also the three signals which were sent out. Fig. 2 shows how wind drift can be eliminated by using these radio beacons. With the non-directional type of transmitter the airplane follows a desultory and zig-zagging course. Using a radio beacon as described here wind drift is eliminated and the plane follows the "T" or middle zone and thus keeps on the true course at all times. The directive transmission characteristics of a coil antenna are also shown. In the figure shown here, the antenna is located at O with its plane along the line ED.

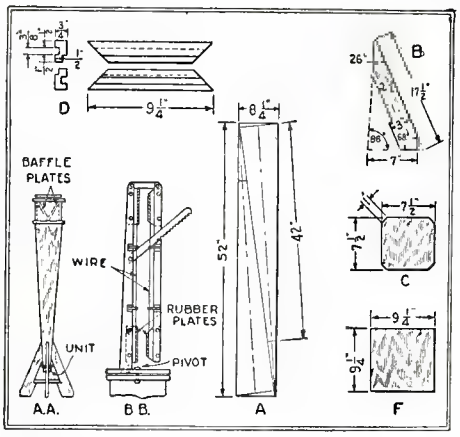
www.americanradiohistory.com

Making a Loop-Speaker

By HERBERT C. McKAY

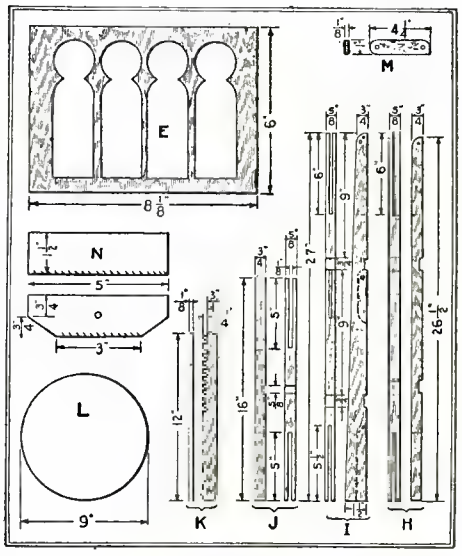


At the left is a view of the completed loop-speaker. Note the arrangement of the two coils which constitute the loop. These coils are hinged at the top. In use, the smaller loop may be connected to aerial and ground, while the larger one is connected to the set.



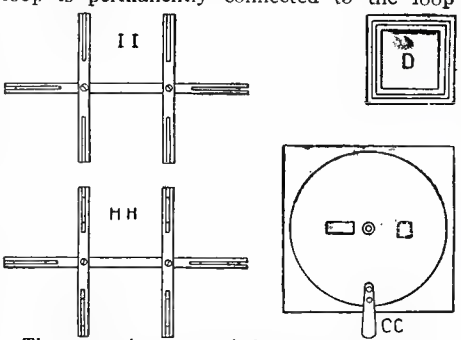
The details for the speaker, loop frames and legs are given in the drawing at the left. The legs are cut from ⅞ inch material and two pieces of three ply panelling are required for the horn itself.

Constructional details of the grill and further details of the loop frame, are given in the drawing at the right. The grill-work may be of any desired design, provided that there is ample open space.



THERE are many experimenters who prefer a horn type speaker for the radio, yet who do not care for the usual curved, short horn type. There are also many who use a loop but object to having it too near the receiving set. The loop-speaker described here fulfills all of the requirements of such experimenters, yet may be placed in the living room without offending the taste.

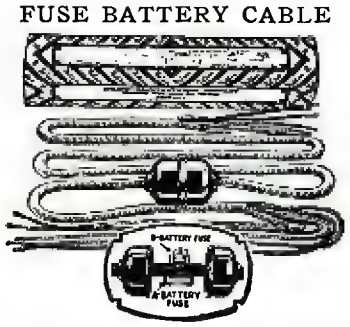
Briefly this unit consists of a straight horn type speaker of all wood construction with a combination loop mounted upon it. In use, the smaller loop may be connected to aerial and ground, while the larger one is connected to the set. This gives an inductive pick-up which utilizes the pick-up of the aerial system, yet which to a certain extent cuts down static but is not directional. By throwing a switch or by changing connections on a binding post strip, the two loops may be connected in series. Moreover, the induction in either case may be varied by swinging the smaller loop outward where it is held in position by a supporting brace. The loop may be rotated upon its base by means of a small handle. The speaker itself may be used with any unit. One side of the large loop is permanently connected to the loop plug, or to a loop terminal within the set. A triple pole double throw switch is necessary. This switch connects the loops in series or provides for an inductive relation between them. The aerial and ground leads are connected in the conventional manner to a double-throw double pole switch, for throwing the connections to the loop or direct to the set. The two loops are of the pancake type and are made according to the dimensions shown. They are assembled as shown at HH and II. At one quarter inch intervals, diagonal slots ⅛" deep are cut. These grooves hold the wire in place. Note that at the upper end of arms H and I a one inch open space is left to take the piece M, and at the lower end of I, a ½" space is left. The brace K is cut from close grained wood as shown. When the two loop supports are completed, they are wound with good stranded loop wire, taking care that the windings are made in the proper direction so that there will be no "bucking" when the loops are hung. Free ends are left about one foot long for convenience in wiring. The unit for the speaker is placed as shown in AA, and secured in any convenient manner, preferably with a rubber strap or spring band. This complete loop system can be easily made.



The supporting arms of the loop are fastened in the manner shown above. The arm of the loop is mounted upon the circle L, as shown by the solid rectangle in CC.

(*Continued on page* 646)

FUSE BATTERY CABLE

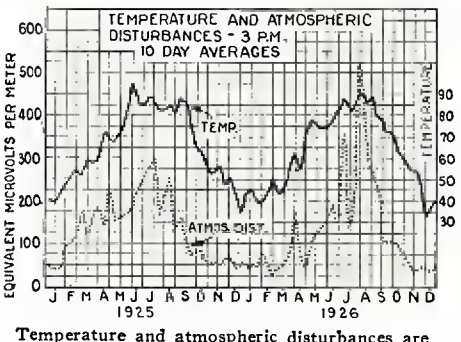


A view of the new fuse battery cable is shown above. Note the method of inserting the fuse, which is placed between the two covers. A separate fuse is provided for the "A" battery and "B" battery circuits.

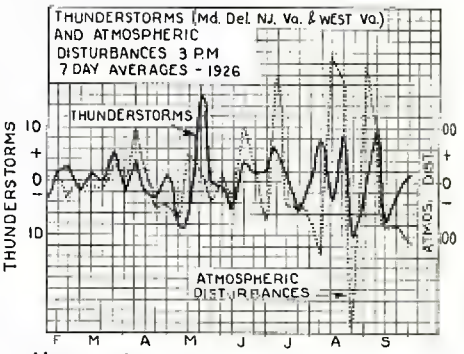
THE new fuse radio battery cord is designed to protect the tubes, wiring and rheostats, in a radio set, from short circuit. It is provided with a very small capacity fuse inserted in the negative "B" battery lead and a two ampere cartridge fuse inserted in the positive "A" battery lead. The fuses are removable for replacement, and are protected from breakage by a bakelite cover. All of the wires in the cable are colored in the conventional manner. The "B" battery fuse is designed to protect the tube filament from high "B" voltage.—*Courtesy Belden Mfg. Co.*

STATIC AND THUNDERSTORMS

WITH summer static making itself felt, it is interesting to learn that government experts are now convinced that there is evidently a close relation between static and thunderstorms. It has just been found that there is also a relation between static and temperature. The conclusions are based upon observations made over eight months, from February to September, by Dr. L. W. Austin, in charge of the Laboratory for Special Radio Transmission Research at the Bureau of Standards in Washington. Practically every peak of the thunderstorm curve is accompanied by a peak in static. Correspondingly, every trough in the curve is accompanied by low static. Thus the same condition of weather that produces thunderstorms seems to be capable of producing static. While there seems to be some evidence of solar influences on long-wave daylight atmospheric disturbances, at present, the proof seems insufficient to establish this with certainty. It may be that the influence of solar activity on the weather also produces static.


TEMPERATURE AND ATMOSPHERIC DISTURBANCES - 3 P.M.
10 DAY AVERAGES
EQUIVALENT MICROVOLTS PER METER
TEMPERATURE
TEMP.
ATMOS. DIST.
J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926

Temperature and atmospheric disturbances are definitely related to each other, as shown in the above graph. This represents the close relationship between atmospherics and local temperature averaged in ten day periods.



Above we have a graph prepared by the U. S. Bureau of Standards at the Special Radio Transmission Laboratory. This graph shows the definite connection between atmospheric disturbances and thunderstorms.

www.americanradiohistory.com

RADIO ORACLE

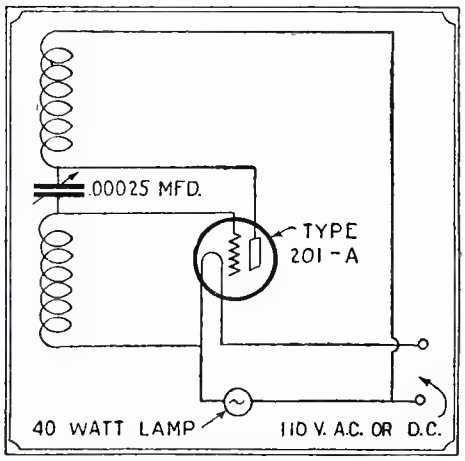
In this department we publish questions and answers which we feel are of interest to the novice and amateur. Letters addressed to this department cannot be answered free. A charge of 50c. is made for all questions where a personal answer is desired.

SHORT-WAVE WAVE METER

(579) A. J. Hallock, Tracy, Calif., writes:

Q. 1. Will you give me the necessary information for the construction of a short-wave wave meter operating on D. C. current, which will tune as high as the 80 meter wave band?

A. 1. On this page you will find illustrated the circuit diagram of a short-wave wave meter, which will operate on either A. C. or D. C. current. For twenty meter work use 2 turns in grid and plate circuit. For forty meter work use 7 turns in grid circuit and 5 turns in plate circuit. For 80 meter band use 14 turns in grid circuit, 10 turns in plate circuit. Windings should be of No. 18 bell wire on 2½ inch tubing.



The circuit diagram for the short-wave wave meter is given here. This wave meter may be constructed very easily and operates on either A. C. or D. C.

TRANSFORMER LOSSES

(580) W. S. Preston, Red Creek, N. Y., writes:

Q. 1. What is meant by the hysteresis loss in an audio frequency transformer?

A. 1. Hysteresis losses occur in the iron core of an audio frequency transformer. That is due to the fact that iron, although readily magnetized, has a tendency to retain its magnetism. When the current through the primary of the transformer rises or flows in one direction, the core is correspondingly magnetized; and when the current in the primary is reversed, the direction of flux through the core is reversed also. But, owing to the slight tendency of the iron's magnetism to "remain behind," a certain amount of the energy of the alternating current is expended in overcoming this lagging magnetic effect. This wastage of energy is the hysteresis loss, and although it is of some importance in transformers used for transmitting, it is negligible in the audio frequency transformer as used for reception.

SIGNS OF OVERCHARGING

(581) E. F. Kirckcaldy, Roxbury, Mass., asks:

Q. 1. What are the signs that a battery has been overcharged?

A. 1. One indication is the color of the plates; in a badly overcharged battery, the positive plates instead of being brown are much too dark and at times are almost black. The negative plates will then be a dark blue-grey. The condition of the plates also indicates overcharging, and the positive plates will often show disintegration where the active material has fallen out of the grid. When on charge, the electrolyte tends to turn brown, in bad cases.

A QUESTION OF FLUX

(582) L. Lunkin, Enid, Okla., asks:

Q. 1. I propose adding a choke filter output circuit to my present receiver. I have a transformer, the primary of which is burnt out. Will the secondary be suitable for use as a choke?

A. 1. The iron core of a transformer is designed to accommodate only a limited magnetic flux, since most audio frequency transformers are intended to be used after medium impedance tubes, where the plate current is small. If the transformer is used as an output choke, it is probable that the core will saturate and cause distortion, due to the comparatively heavy plate current. This is more especially the case, if the secondary winding is used, owing to the large number of turns, and, therefore, the greater magnetic flux produced for a given current.

EXPERIMENTAL VOLUME CONTROL

(583) J. Stree, Manila, P. I., writes:

Q. 1. I have been experimenting with a variable resistance in series with the loud speaker, in order to control volume. And it seems to me that not only the volume, but the tone of the loud speaker is altered in this way. Could a resistance like this alter the tone, or is it my imagination?

A. 1. The insertion of a series resistance would affect the tone of the output, and if a condenser is placed across this resistance the effect may be further altered by changing the capacity of the condenser.

In this way it is possible somewhat to emphasize either the high or the low notes, if one is prepared to experiment to find the correct values of resistance and capacity to suit the conditions of the output circuit.

LAMINATED CORES

(584) A. T. Plottz, Erie, Pa., writes:

Q. 1. What is the object of building up the cores of audio frequency transformers from a number of thin laminations? What is the objection to using a solid iron core?

A. 1. The iron core constitutes a mass of conducting material lying in the varying magnetic field set up by the varying currents flowing through the transformer windings. The core will, therefore, have induced currents set up in it which will represent so much energy withdrawn from the circuits in which the windings are included.

It is with the object of reducing the degree of these induced currents, and so restricting the wastage of energy, that the core is built up of laminations. As each lamination is insulated from those next to it, by being enamelled or by some other method, the induced currents can not circulate freely throughout the core.

HUM IN RADIO SET

(585) W. S. Clawson, Red Hook, New York, writes:

Q. 1. I have a radio set which utilizes impedance coupled audio amplification. When using this set with a "B" eliminator I get a loud humming noise. The eliminator works fine with my other set. What is the matter?

A. 1. Operate the impedance coupled set on dry "B" batteries as an experiment, instead of with the eliminator. If this overcomes the trouble it is reasonably sure that the by-pass condensers between the several tube plates and the grounded side of the "A" battery are of insufficient capacity or incorrectly placed, resulting in the effect known as "motor-boating." The addition of suitable choke coils in each plate lead near the eliminator terminals may also be desirable.

CALCULATING ANTENNA WAVELENGTH

(586) E. G. Bigwell, Cheswick. Pa., writes:

Q. 1. Will you give me a method whereby I may calculate the wavelength of my antenna?

A. 1. There is a definite relation between the total length of the antenna system and the natural period or wave length for which the system is best adapted. In this calculation the length of the antenna, the lead-in wire (including any extensions of the lead-in wire used as antenna), and the ground wire are effective parts of the system. The wavelength or natural period of the antenna system may be calculated in meters by the following approximate rule: Add together the length in feet of the antenna, the lead-in, and the ground wire, then multiply the total length of all three by 1.5. For example, if the antenna is 100 feet long, lead-in 30 feet, and ground wire 20 feet, the total length is 150 feet. Multiplying the 150 by 1.5, the result is 225, the natural period or wave length of antenna system in meters.

REFLEXING ON SHORT WAVES

(587) T. Stewart, New York City, N. Y., writes:

Q. 1. I have a reflex receiver which has given very good results. The set uses plug-in coils and thus I am enabled to cover a large wave length range. Recently I purchased some short wave plug-in coils, but can obtain no success with these. Can you tell me where I have gone wrong?

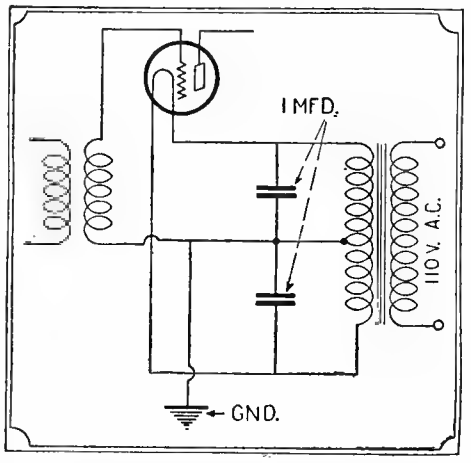
A. 1. It is asking too much of any reflex receiver, no matter how well designed, to expect it to give satisfaction on short wave lengths. It must be remembered that it is necessary first, to get a tube to give complete satisfaction as a plain radio frequency amplifier on short wave lengths, before we attempt to reflex it. In other words, reflexing consists in the use of a tube, performing the functions of a radio frequency and audio frequency amplifier simultaneously. It is obvious, therefore, that before a tube can be said to be performing the functions of a reflex tube, it must give some account of itself as a radio frequency amplifier. First, let us make the tube perform efficiently as a radio frequency amplifier, before we proceed to reflex it. In our opinion, it would be far better to build a separate receiver for the reception of short waves. Numerous articles describing these receivers have appeared in this magazine and *Radio News*, from time to time.

ELIMINATING HUM IN A. C. TUBES

(588) C. Shielde, Coney Island, Brooklyn, N. Y., writes:

Q. 1. I find when using the A. C. tubes that a continuous hum is produced in my receiving set. Can you suggest a simple remedy for this other than the use of center tapped resistances across filament terminals? The transformer I am using at present employs a mid-tap which is not used.

A. 1. On this page you will find illustrated a diagram, showing a simple method of eliminating A. C. hum in an A. C. filament circuit, utilizing a transformer with a mid-tap. Very often in



A. C. hum in an A. C. filament circuit, using a center-tapped transformer, can usually be minimized by using two by-pass condensers as shown.

A. C. filament circuits utilizing transformers with mid-taps better operation will be obtained if a by-pass condenser is inserted between the mid-point and the two outside leads of the low voltage end of the primary. This is shown in the accompanying drawing. The condensers should have a capacity of about 1 mfd. These condensers function as by-passing condensers for any R. F. currents which may find their way into the filament circuit. Being located as they are, the undesired currents are by-passed to the mid-tap, which is usually connected to ground or is at ground potential. In some instances, particularly in A. C. power amplifiers, condensers so located reduce the hum in the output circuit. Their reactance at 60 cycles, the frequency of the A. C. current, is sufficiently high, so that they do not cause any effect upon the filament voltage output of the transformer. By-passing condensers in every possible location will always be advantageous in receivers utilizing A. C. on the filaments.

KEEPING OUT R. F. CURRENTS

(589) R. Holt, Green Bay, Wisc., writes:

Q. 1. I notice that in several recent issues of radio magazines resistances of about ¼ megohm are connected directly to the grid circuit of the first audio frequency amplifier. I should be glad to know if this arrangement may be applied when an audio frequency transformer couples the detector output to the amplifier.

A. 1. The stabilizing resistance may be used in a transformer coupled set, and it will certainly do no harm. It is doubtful, however, whether its inclusion is worth while, and in many cases the difficulties of separating the radio frequency and audio frequency components are less pronounced with transformer coupling than when a resistance is used.

COIL DATA

(590) O. Werg, Hawthorne, N. J., writes:

Q. 1. Will you kindly give me the data for coils which will cover the wave length band for broadcast reception? These coils will be wound with No. 24 or No. 26 D. C. C. wire, on a 2 inch form, and will be tuned by a .0005 or .00035 mfd. variable condenser.

A. 1. A 2 inch coil wound with No. 24 D. C. C. wire and tuned by a .00035 mfd. variable condenser will require 101 turns of wire and if tuned by a .0005 mfd. variable condenser will require 76 turns. The same size coil, wound with No. 26 D C. C. wire, when tuned with a .00035 mfd. variable condenser will require 93 turns, and if a .0005 mfd. variable condenser is used, 70 turns of wire will be necessary. No. 24 D. C. C. wire winds 33 turns per inch and No. 26 wire winds 38 turns per inch.

www.americanradiohistory.com

Scientific Humor

NOT SURPRISING

TIM: "So John's still in the hospital?"

JIM: "Yes, they tried confusion of blood and he's flighty yet."—*Clara E. Smith.*

CONVICTED

CRASH!

"You did that on purpose," screamed the lady whose car had just been hit.

"Why madam," said the driver of the other car, "you don't suppose I'd do a thing like that on purpose, do you?"

"You did too! What have you got those bumpers on for, if you didn't intend to bump someone?"

PLOP!

Dick Dawson, Rep No. 23,830.

A PERPETUAL SEASON

A woman entered the shop of a bird stuffer. In her hands was a stuffed parrot.

"Do you remember," she asked, "The bird you stuffed for me last autumn? Well, the work was done so badly that the feathers are falling out."

"That, madam," replied the bird stuffer, "is a triumph of modern science. We stuff our birds so well that they molt at the right season."—*R. J. Hall.*

SLOW TO RECOVER!

QUESTION: What is this world coming to?

ANSWER: It isn't coming to, its still under the ether.—*Myron Averill.*

CAN'T SEE 'EM

Boss: "Why don't you put a display in the window?"

CLERK: "There is a display there."

Boss: "I can't see anything."

CLERK: "That's a display of invisible hair nets and vanishing cream."

E. S. Karoly, Rep. No. 22,846.

OXCUSE THE HORSENESS

PROFESSOR (to dumb student): "Melville, sit down immediately! The idea! Trying to tell me that they have succeeded in breeding a new kind of animal called the equinox."

—*R. J. Hall.*

First Prize $3.00

DRESSED RIGHT

"I know where the 'lectricity comes from that lights our house," said Alice.

"Where does it come from?" queried her aunt.

"From the wall," replied Alice. "When ma wants a light she unbuttons it."

—*Joseph Holliday.*

SEE THE POINT?

TOM: "I made a pin hole camera."

JERRY: "Who wants to photograph pin holes."—*Leslie Carpenter.*

WE receive daily from one to two hundred contributions to this department. Of these only one or two are available. We desire to publish only scientific humor and all contributions should be original if possible. Do not copy jokes from old books or other publications as they have little or no chance here. By scientific humor we mean only such jokes as contain something of a scientific nature. Note our prize winners, Write each joke on a separate sheet and sign your name and address to it. Write only on one side of sheet. We cannot return unaccepted jokes. Please do not enclose return postage.

All jokes published here are paid for at the rate of one dollar each, besides the first prize of three dollars for the best joke submitted each month. In the event that two people send in the same joke so as to tie for the prize, then the sum of three dollars in cash will be paid to each one.

TRICK PICTURES

MOVIE ACTOR: "What! I'm expected to tumble off this cliff!"

CAMERAMAN: "Sure! Dot's all right. Take your time und fall nice and slow. I can make it look fast in der pictures."—*Henry Vanderholt.*

FROM A COLLEGE EXAM

(*Definitions of a Bolt and a Nut*)

A bolt is a piece of mechanism about so long or longer, with a bunch of iron on one end and a number of scratches on the other.

A nut, however, is very much different. A nut is a hole with a square piece of iron around it and wrinkles on the inside of the hole.—*Mac D. Perkins.*

HOT STUFF

"They say paper is a fine thing to keep you warm during the winter."

"Yes, especially if it's in the form of a note. One of them kept me in a sweat for thirty days."—*Miss Ella Hoffman.*

HIS COMPLAINT

BILL: "I say, Tom, are you ever troubled with sleeplessness?"

TOM: "I am. Some nights I don't sleep three hours."

BILL: "I pity you, then. I've got it awfully bad. I've been afflicted now for about two years. The doctor calls it 'neurio insomnia paralaxitis.'"

Tom grunted and said: "I've had it about six months; but we call it a baby."—*Miss Nellie Taylor, Rep. No. 22,048.*

ATOMIC DESTRUCTION

VISITOR: "Is your new projectile very destructive?"

INVENTOR: "Destructive? Say, one shot'll make Unknown Soldiers out of a whole regiment of generals."—*Gleason Pease.*

AS ADVERTISED

"Oh well," sighed the stylish stout as she heard a loud snap in the vicinity of her reducing girdle. "They said it would reduce the hips or bust."—*J. L. Caudill.*

POCKET'S A BAROMETER

SHE: "Wouldn't it be better if we didn't go out to supper; I think it's going to rain."

HE: "Yes, I think so too, I can tell by the change in my pocket."—*T. U. Watson.*

AND SMELTS ARE FISH

"Do fish smell?" asks a scientist.

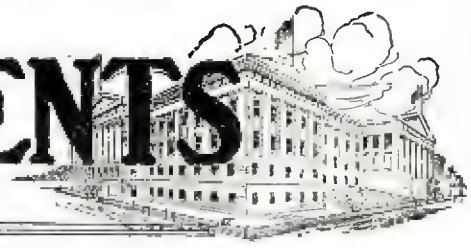
"We ask you.—Do they?"—*R. Reynolds.*

SCIENTY SIMON, Scientist

THERE'S JUST THE THING FOR A ROPE FIRE-ESCAPE
D BETTER TRY IT OUT FIRST--
OUCH!
WOW!! I'M BURNING UP!!
SCIENCE LESSON NO. 12
WHEN TWO SURFACES ARE RUBBED TOGETHER VIGOROUSLY THE FRICTION BETWEEN THEM PRODUCES A LARGE AMOUNT OF HEAT.
W LEMKIN

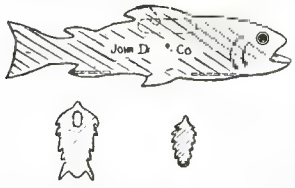
www.americanradiohistory.com

LATEST PATENTS



ADVERTISING DEVICE

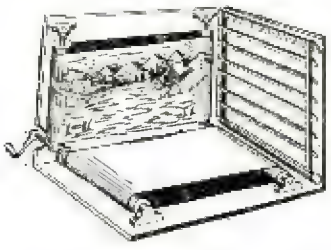
No. 1,580,227, issued to Dale Craig Wilhelm. The invention shown here is an advertising device comprising a buoyant body portion and



provided with a means for adjusting the center of gravity and the weight of the floating object at will. A series of inclined corrugations are formed on each side.

THEATRE APPLIANCE

No. 1,600,039, issued to Joseph A. Cunningham. The device shown below is a theatre appliance which provides for a movable scenic back-



ground. The background and movable platform are so mounted that they can be operated in unison in the same direction.

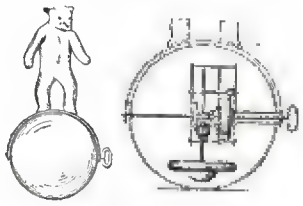
METHOD OF PRESERVING EGGS

No. 1,635,843, issued to George Hofmann. This method of preserving eggs consists in introducing a liq-

uid antiseptic material into the interior of the egg, and thus the contents of the egg completely fill the shell.

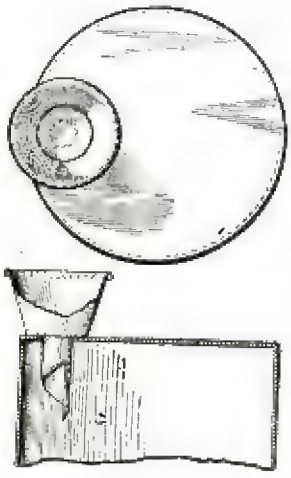
SPRING MOTOR

No. 1,632,693, issued to John Buttigieg. The illustration below shows a spring motor which is attached to an amusement device. The object is to provide a motor for imparting rotation to a ball or cylinder within which the motor is mounted. A fly wheel, driven by the motor, maintains a fixed center of gravity for the motor frame. The illustration shows a toy equipped with this motor and also an interior view of the cylinder.



PERFORATING, SEALING AND MEASURING DEVICE

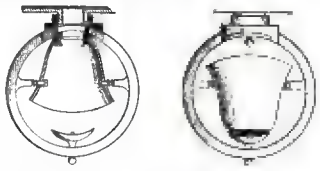
No. 1,606,527, issued to James C. Hanes and Clemens C. Gogle. The invention shown here comprises a perforating instrument adapted to form a pouring opening in a can.



One end of this instrument is provided with a flat seat which serves as a closure for the opening when made. When the opening is formed in the can, the instrument may normally constitute a stopper and will render the can air tight. When pouring out the contents the cup shaped portion may be used as a measure for determining the discharge of material. In using the invention, the cupped portion is grasped in the hand of the operator, so that the hand may come in free contact bearing with the rolled edge. The instrument is then forced into the can and thus forms a convenient opening. The device is admirably useful in connection with metallic cans or containers intended for the temporary storage of food.

RADIATOR FILLER

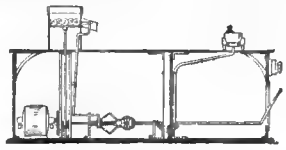
No. 1,619,498, issued to William Floyd Combs and Joseph Mahonry Beck. The device shown here is a



combination automobile filling bell and ornamental radiator cap, the bell portion may be inverted and thus used as a funnel for filling the radiator.

AMUSEMENT DEVICE

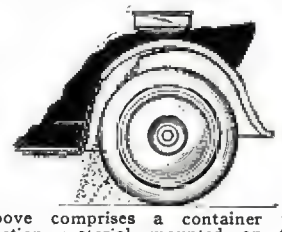
No. 1,554,165, issued to William O. McElroy and Joseph F. Tropea.



This device provides amusement and instruction for children.

NON-SKID DEVICE

No. 1,625,746, issued to Isadore L. Rosenthal. The invention shown



above comprises a container for friction material mounted on the mudguard of a road vehicle.

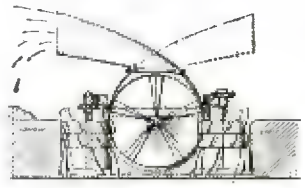
ELECTROMAGNETIC LIGHT BATHING APPARATUS

No. 1,615,295, issued to Gustav von Hutschler. The invention shown

here is applicable for applying light to various parts of the body.

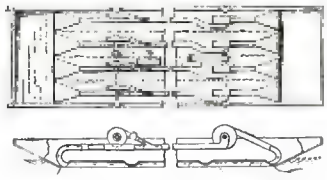
SNOW REMOVING MACHINE

No. 1,615,461, issued to Erich H. Lichtenberg. The device shown here evolves a new method of snow removal. The machine cuts the snow into flaky particles and throws the snow laterally to one side. A cutter member is disposed on each side of the machine, and serves to excavate the snow.



AIR-FLOATED BARGE

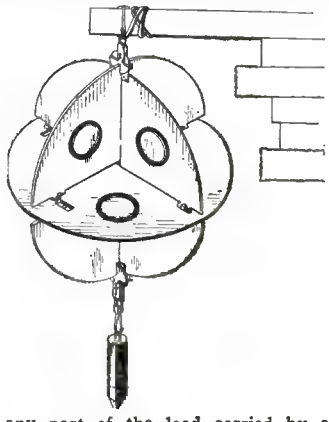
No. 1,621,625 issued to Vasco F. Casey. The boat shown here has a flat bottom fitted with longitudinal air channels. Power driven blowers



discharge air in a rearward direction under the bottom of the boat. Air return pipes lead to the blowers.

TRAFFIC WARNING DEVICE

No. 1,635,915, issued to Wilfred Jones White. The object of this invention is to provide a warning device which can be attached to

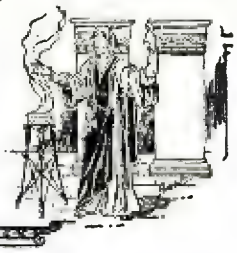


any part of the load carried by a motor truck. The device is collapsible and may be readily carried when not in active use. The article is of such an unusual character that it cannot fail to be observed. The folding portions of the warning member are retained in extended position by a particular locking device.

NOTICE TO READERS. The above illustrated and described devices have recently been issued patent protection but are not as yet to our knowledge available on the market. We regret to advise that it is impossible to supply the names and addresses of inventors of the above devices to any of our readers. The only records available, and they are at the Patent Office at Washington, D. C., give only the addresses of the inventors at the time of application for a patent. Many months have elapsed since that time, and those records are necessarily inaccurate. Therefore, kindly do not request such information as it is practically impossible to obtain up-to-date addresses. —EDITOR.

www.americanradiohistory.com

THE ORACLE



The "Oracle" is for the sole benefit of all scientific students. Questions will be answered here for the benefit of all but only matter of sufficient interest will be published. Rules under which questions will be answered:

1. Only three questions can be submitted to be answered.
2. Only one side of sheet to be written on; matter must be typewritten or else written in ink; no penciled matter considered.
3. Sketches, diagrams, etc., must be on separate sheets. Questions addressed to this department cannot be answered by mail free of charge.
4. If a quick answer is desired by mail, a nominal charge of 50 cents is made for each question. If the questions entail considerable research work or intricate calculation, a special rate will be charged. Correspondents will be informed as to the fee before such questions are answered.

PROPERTIES AND DEFECTS OF ETHER

(2211) J. O. McAteer, Zamora, Calif., writes:

Q. 1. I would like to know what effects sulphuric ether has upon persons, and also some of its properties.

A. 1. Sulphuric ether, ordinary ether, is as a solvent for fats, oils, resins, many alkaloids and certain organic salts. The ether used for surgical purposes contains a small amount of water and alcohol; its specific gravity varies between 0.725 and 0.728. In medicine ether is sometimes used as a local anaesthetic, producing intense cold when injected subcutaneously, it rapidly acts as a stimulant on the heart and respiration, and is therefore highly valuable in fainting. The administration of ether is somewhat difficult and is liable to have an irritating effect on the kidneys and to increase bronchitis in patients suffering from it. The effects of ether are similar to those of opium. The digestion is impaired, the heart becomes irregular and gradually nervous exhaustion and general weakness are produced; the weakness of the body is followed by the weakness of the will, hallucinations and mental confusion. The disagreeable after effects of the ether anaesthesia have now been completely abolished.

COLORING OF FLOWERS

(2212) Mr. A. T. Kimball, Rockland, Maine, asks:

Q. 1. Could you briefly tell me what are the chemicals used in the artificial coloring of flowers? Are the chemicals likely to injure the flowers or to kill them in a short time?

A. 1. A method employed by florists to impart a green color to the white petals of "carnation pinks" consists in allowing long-stemmed flowers to stand in water containing a green aniline dye. When the flowers are fresh they absorb the fluid readily, and the dye is carried to the petals.

Some dyes can thus be taken up by the capillary action of the stem and deposited in the tissue of the petal. If flowers are placed over a basin of water containing a very small amount of ammonia in a bell glass, the colors of the petals will generally show some marked change. Many violet-colored flowers when so treated will become green, and if the petals contain several tints they will show greens where reds were originally, yellows where there were whites, and deep carmine will become black. When such flowers are put into water they will retain their changed colors for hours. If violet asters are moistened with very dilute nitric acid, the ray florets become red.

FORCES

(2213) Mr. Nathan Greenspan, Sullivan County, New York, writes:

Q. 1. Please list for me all the known types of forces and a definition of each.

A. 1. A force is anything that tends to change the state of a body with respect to rest or motion. If a body is at rest, anything that tends to put it in motion is a force; if a body is in motion, anything that tends to change either its direction or its rate of motion is a force.

A force should always mean the pull, pressure, rub, attraction (or repulsion) of a body upon another, and always implies the existence of a simultaneous equal and opposite force exerted by that other body on the first body, i.e., the reaction. In no case should we call anything a force unless we can conceive of it as capable of measurement by a spring balance, and are able to say from what other body it comes.

Forces may be divided into two classes, extraneous and molecular; extraneous forces act on bodies from without; molecular forces are exerted between the neighboring particles of bodies.

Extraneous forces are of two kinds, pressures and moving forces; pressures simply tend to produce motion; moving forces actually produce motion. Thus, if gravity act on a fixed body, it creates pressure; if on a free body, it produces motion.

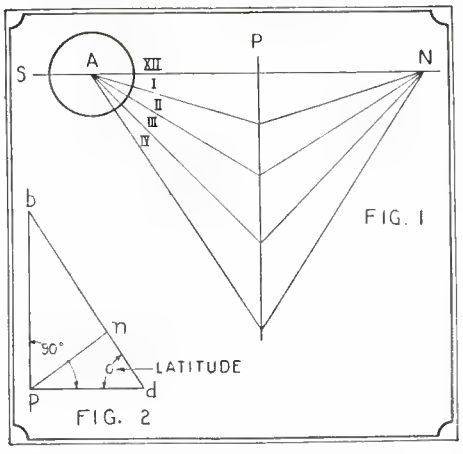
Molecular forces are of two kinds, attractive and repellent; attractive forces tend to bind the particles of a body together; repellent forces tend to thrust them asunder. Both kinds of molecular forces are continually exerted between the molecules of bodies, and on the dominance of one or the other depends the physical state of a body as solid, liquid or gaseous.

MARKING OFF A SUN DIAL

(2214) H. P. Breams, Judith Cap, Montana, writes:

Q. 1. I am enclosing a sketch which shows the markings of a sun dial. How are the distance AP and PN obtained?

A. 1. The drawing representing a horizontal dial submitted by the querist has been reproduced herewith, in Fig. 1. It is assumed that the lines



The above diagram shows a method by which a sun dial can be marked off, and how the distances AP and PN are obtained.

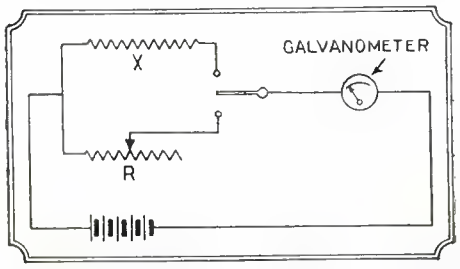
at the right of perpendicular line are 15° divisions of a circle, and those on the left are the resulting hour lines; A being the dial's center. Distances AP and PN may be obtained as follows:—Set up to any convenient scale a triangle representing the gnomon, as diagram, Fig. 2, and from p draw a line perpendicular to style db, meeting same in n. Then the ratio of distance AP to distance PN in Fig. 1 will be as dp is to pn in Fig. 2.

MEASURING RESISTANCES

(2215) T. A. Weston, Greene, Iowa, asks:

Q. 1. Will you please give me a simple method for measuring resistances? The apparatus which is used should not be expensive, as it will not be put to much use.

A. 1. On this page you will find illustrated what is known as the substitution method of measuring resistances. The apparatus consists of a galvanometer, and an adjustable rheostat. The unknown resistance X and the galvanometer are



The diagram appearing above shows how resistances may be measured by the substitution method.

connected in series with a source of continuous current and the galvanometer deflection is noted. Then, substitute for the unknown resistance X, a known adjustable resistance R by moving the switch, and adjust the value of R until the galvanometer deflection is the same as before. The resistance in the rheostat is now equal to the unknown resistance, since the current through the galvanometer is the same as before, and the pressure is also the same.

ANTI-FREEZING COMPOUND

(2216) Mr. Williams R. Anderson, Minneapolis, Minn., writes:

Q. 1. Will you please give me several formulas of substances to be used as anti-freezing compounds for automobile radiators.

A. 1. In order to prevent freezing of the cooling water, when the engine is not in operation in cold weather, solutions are used, notably those of glycerine and of calcium chloride ($CaCl_2$). The proportions for the former solution are equal parts of water and glycerine, by weight; for the latter, approximately ½ gallon of water to 8 pounds of $CaCl_2$, or a saturated solution at 60° F. This solution ($CaCa1_2$+6 H_2O) is then mixed with equal parts of water, gallon for gallon. Many persons complain that $CaCl_2$ corrodes the metal parts, but this warning need do no more than urge the automobilist to use only the chemically pure salt, carefully avoiding the "chloride of lime" ($CaOCl_2$).

A practical manufacturing chemist of wide experience gives these data:

"A saturated solution of common salt is one of the best things to use. It does not affect the metal of the engine, as many other salts would, and is easily renewed. It will remain fluid down to 0° F., or a little below.

"Equal parts of glycerine and water is also good, and has the advantage that it will not crystallize in the chambers. Some of the water may evaporate but the glycerine will not. It is the most convenient solution to use on this account, and may repay the increased cost over brine, in the comfort of its use. It can be removed in the spring and be used a second winter. It needs only the occasional addition of a little water to make it last all winter and it leaves the machinery clean when it is drawn off. With brine an incrustation of salt as the water evaporates is bound to occur which reduces the efficiency of the solution until it is removed. Water frequently must be added to keep the original volume, and to hold the salt in solution. A solution of calcium chloride is less troublesome so far as crystallizing is concerned, but is said to have a tendency to corrode the metals."

Anti-Freezing, Non-Corrosive Solution.—A solution for water-jackets on gas engines that will not freeze at any temperature above 20° below zero (F) may be made by combining 100 parts of water, by weight, with 75 parts of potassium carbonate and 50 parts of glycerine. This solution is non-corrosive and will remain perfectly liquid at all temperatures above its congealing point.

SIDE TONE IN TELEPHONY

(2217) Mr. Alvin F. Harlow, Philadelphia, Pa., inquires:

Q. 1. What is "side tone" as it is referred to by telephone engineers?

A. 1. Side tone is the name given by telephone engineers to the sounds heard in your telephone receiver caused by the operation of your own transmitter. It is an effect which most users of the telephone do not notice because it is natural in any conversation whether over the telephone or not. If you speak in an ordinary room some of the voice energy reaches your own ears, part of it directly and part by reflection from the walls, floor and ceiling. Hearing your own voice leads you unconsciously to adjust the loudness of your tone to the proper volume. If the room surfaces are padded with sound deadening material your voice will sound unnatural. An interesting example of this is the dislike for heavily draped broadcasting studios frequently expressed by artists in the early days of radio broadcasting.

In your telephone the transmitter and receiver must both be in the circuit ready for instant use at all times during the conversation. Any other practicable arrangement would mean troublesome switching for the subscriber and a condition which would appear unnatural, not only because of lack of response to his own voice, but because the distant talker could not "cut in" whenever he chose to do so. The result is that in the well designed telephone sets most commonly used, a proper part of the voice energy as converted into electrical form by the transmitter, passes through the talking subscriber's receiver producing the effect of side tone.

www.americanradiohistory.com

All Electric Radio

Single Dial 7 Tube Set—30 Days Free Trial

Agents! Dealers! Big Profits!

Make Big Money taking orders for Metrodynes—all or part time. Metrodyne All Electric Radios are in a class by themselves. Unequalled for quality, performance and price. Demonstrate at home and take orders. Lowest wholesale prices. Your Demonstrating Set on 30 days' FREE trial. Mail the coupon below for complete details.

Three Year Guarantee

Metrodyne

ALL ELECTRIC RADIO

"Simply press the switch button and it's on"

NOW! A real electric radio set! Costs less than most battery sets. No batteries—no chargers—no eliminators—no acids—no liquids! Shipped direct from our factory at rock bottom prices and on 30 DAYS' FREE TRIAL.

At last! The radio you've dreamed about! If you have electricity in your home you can now really enjoy coast to coast radio reception without the care, bother and muss of batteries, chargers, eliminators, etc. The Metrodyne All Electric is a real, genuine batteryless radio set. Simply insert the plug in the socket, press the switch button and "tune in." You could not possibly buy a better radio set than the Metrodyne All Electric, no matter what price you paid.

no

~~A-Batteries~~
~~B-Batteries~~
~~C-Batteries~~
~~Eliminators~~
~~Chargers~~
~~Acids~~

30 DAYS FREE TRIAL

GORGEOUS CONSOLE ELECTRIC RADIO

Here is the Metrodyne All Electric Console Radio—a gorgeous, genuine walnut cabinet, in a beautiful two-tone finish. Has a built-in genuine Metro-Cone large size speaker. Brings in programs with great volume, reproducing the entire range from the lowest to the highest notes with remarkable clearness and distinction. All metal parts are finished in old gold. Wonderful electric radio, in a cabinet that will beautify the appearance of any home.

COSTS LESS THAN MOST BATTERY SETS

Do not confuse the Metrodyne All Electric radio with ordinary light socket sets, because the Metrodyne is truly an **all electric radio** — consumes less than 2c worth of electricity a day. Comes to you **direct from the factory.** Its low cost brings it down to the price of an ordinary battery set. We are so confident that you will be delighted with this wonderful, easy-to-operate **batteryless radio** that we offer to ship it to your home for **thirty days' free trial** — you to be the judge.

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal **30 days' free trial** offer, which gives you the opportunity of trying before buying. Thousands of Metrodynes have been bought on our liberal free trial basis—**Write Today!**

BEAUTY — EFFICIENCY DEPENDABILITY

The Metrodyne All Electric table model Radio is a 7 tube, single dial set. Only the highest quality low loss parts are used throughout. Solid walnut cabinet, beautiful two-tone effect, with handsome gilt metal trimmings. Size of cabinet, 28 inches long, 13 inches deep, 10 inches high. Has electrically lighted dial—easy to log stations, even in the dark. Only one dial to tune in all stations. Excellent tonal qualities — wonderful volume — very selective.

Mail This Coupon

Learn all about the marvelous Metrodyne All Electric Radio before buying any radio set. Let us send you the proof of quality. Read the letters from thousands of enthusiastic owners. Get our rock bottom direct-from-factory prices and our liberal **thirty days' free trial offer.**

FREE TRIAL COUPON

METRO ELECTRIC COMPANY
2165 N. California Ave., Dept. 628
Chicago, Illinois

Gentlemen:

Send me full particulars about Metrodyne All Electric Radio and your thirty days' free trial offer.

Name .....

Address .....

If you are interested in AGENT'S proposition lace an "X" in the square ☐

METRO ELECTRIC COMPANY

2165 N. California Ave. Dept. 628 Chicago, Illinois

www.americanradiohistory.com

The Day-Dreamer

Will he ever wake up?

His life is made up of rosy visions.

He sees himself in a manager's office—as the president of a firm -with a $20,000 salary perhaps even as a millionaire with a Rolls Royce, a rakish yacht and a swell country estate.

But all this grandeur is in his day dreams. He lives in the goiden PARADISE OF TO-MORROW—and it never comes.

He does nothing with the opportunities that surround him TODAY. He will always be somebody else's servant, instead of master of his own destiny.

How does he get into such a mental state? Because he uses only about ONE-TENTH of his mental energies in doing the vital things that count.

We are nearly all victims of the vicious habit of living far below our God-given endowments! The proof of it is that you have failed to reach the high mark ONCE set for yourself.

You admit it. What you want to know is, WHAT CAN BE DONE ABOUT IT?

There is one very simple thing that you CAN do—now. You can find out what Pelmanism has done for 600,000 men and women, some of whom were facing THE VERY SAME DISSATISFACTION with their attainments that you are feeling. Pelmanism developed the mental powers they lacked—it replaced procrastination with "do it now" efficiency; it put concentration in the place of mind-wandering; it substituted self-confidence for self-distrust.

Since Pelmanism is the science of applied psychology, it brings SELF-REALIZATION to all classes and conditions of men and women—prominent and famous as well as obscure and unknown. And among the better known persons who used and advocate it are:

T. P. O'Conner, "Father of the House of Commons."
The late Sir H. Rider Haggard, Famous Novelist.
General Sir Robert Baden-Powell, Founder of the Boy Scout Movement.
Judge Ben. B. Lindsey, Founder of the Juvenile Court, Denver.
Frank P. Walsh, Former Chairman of National War Labor Board.
Jerome K. Jerome, Novelist.
Gen. Sir Frederick Maurice, Director of Military Operations, Imperial General Staff.
Admiral Lord Beresford, G. C. B., G. C. V. O.
Sir Harry Lauder, Comedian.
W. L. George, Author.
Baroness Orczy, Author.
Prince Charles of Sweden.

—and others, of equal prominence, too numerous to mention here.

A remarkable book called "Scientific Mind-Training" has been written about Pelmanism. IT CAN BE OBTAINED FREE. Yet thousands of people who read this announcement and who NEED this book will not send for it. "It's all tommyrot," they will say.

But if they will use their HEADS, they will realize that people cannot be HELPED by tommyrot and that there MUST be something in Pelmanism, when it has such a record with 600,000 different individuals, and when it is endorsed by the kind of people listed above.

The first principle of YOUR success is to do something radical in your life. You cannot make just an ordinary move, for you will soon again sink into the mire of discouragement. Let Pelmanism help you FIND YOURSELF. Don't put it off. Mail the coupon below now—now, while your resolve to DO SOMETHING ABOUT YOURSELF is strong.

THE PELMAN INSTITUTE OF AMERICA
Approved as a Correspondence School under the laws of the State of New York.
71 West 45th Street, Dept. 3211, New York City

The Pelman Institute of America
71 West 45th Street, Dept. 3211, New York City.

I want you to show me what Pelmanism has actually done for over 600,000 people. Please send me your free book, "Scientific Mind-Training." This places me under no obligation whatever.

Name .....

Address .....

City ..... State .....

The Metal Emperor

By A. MERRITT

(*Continued from page* 595)

The spheres that made up the five petals were about an inch and a half in diameter; the ball they enclosed larger by almost an inch.

So orderly was their arrangement, so resembling a geometrical design nicely done by some clever child, that for a moment I hesitated to disturb it. Then I reached down and picked up one of the pyramids. It clung to the rock, and it was with effort that I wrenched it away. It gave to the touch a slight sensation of warmth. I weighed it in my hand. It was oddly heavy, twice the weight, I estimated, of platinum. I drew out a glass and examined it. Decidedly the pyramid was metallic, but of a texture so fine as to be silken. Nor could I place it among any of the known metals. Yet certainly it was metal. It was striated—slender filaments radiating from tiny, dully lustrous points within the polished surface.

And suddenly I had the weird feeling that each of these points was an eye, peering up at me, scrutinizing me.

"Look! Look at the ring!" whispered Drake.

The ring was in motion!

The cubes moved; the circle revolved; the pyramids raised themselves, stood bolt upright on their square bases; the six rolling spheres touched them, and joined the spinning. With a sleight-of-hand suddenness, the ring drew together. Its units coalesced. With the same startling suddenness there stood, erect, a grotesque little figure, a weirdly humorous, a vaguely terrifying foot-high hobgoblin, squared and angled and pointed and animate—as though a child should build from nursery blocks a fantastic shape which abruptly is filled with throbbing life.

A troll from the kindergarten. A kobold of the toys.

Only for a second it stood, then began swiftly to change, melting with quicksilver quickness from one outline into another, as square and triangle and circle changed places. Their shiftings were like the transformation one sees within a kaleidoscope. In each vanishing form was a suggestion of unfamiliar harmonies, of a subtle, transcendental geometric art as though each swift shaping were a symbol, a word.

As though a Euclidean problem had been given volition. Geometry been endowed with consciousness.

For an instant, the little objects lay motionless. Then nine of the cubes swirled toward each other. Swift as the click of a camera shutter they became a slender pillar nine inches high. Up this pillar glided the larger globe and balanced itself upon the top. The five smaller spheres followed and clustered in a ring just below it. The remaining cubes seemed to slide up the pillar's side, and clicked, two by two, on the outer surface of each of the circled spheres. After them raced two of the pyramids, clicking in their turn, one by one, upon the outer surface of the twin blocks, tipping each with a point. What remained of them joined themselves to the base of the pillar.

The whole action had been rapid, so rapid indeed that my eye could barely follow it. In a twentieth of the time it has taken me to tell it, the figure was complete.

And now the ring that was composed of the five spheres, the cubes and pyramids, began to revolve. Faster it spun, and faster. It became a disc upon which tiny brilliant sparks appeared, clustered and vanished only to reappear in greater numbers.

It swept toward me.

"Drop it! Quick!" I heard Ruth cry. But before I could let fall the pyramid that I had forgotten I still held in my hand, the thing had touched me. A paralyzing shock ran through me. My fingers clenched, as locked. I stood, muscle bound, unable to move.

The little figure paused. Its disc tilted from the horizontal plane on which it was whirling. It was as though it cocked its head to look up –and again I had the impression of innumerable eyes peering at me. It did not seem angry—rather was its attitude one of inquiry, of waiting; almost as though it had asked for something and was wondering why I did not let it have it. Again I tried to release what I held in my hand, but could not unclench the fingers.

The disc tilted back into place, and bent toward me again. I heard a shot, and a bullet ricocheted off the weird pygmy that now was clearly menacing. Drake raised his foot and kicked out at it. There was a flash. He crashed down, and lay sprawling and inert. I saw Ruth leap the crevice and kneel beside him.

From the other side of the fissure came a sibilant whispering, a faint wailing. Over the ruined chamber's floor swept a score or more of the little cubes. They moiled at the fissure's edge, clicked together and thrust themselves across the gap in a slender span, bridging it. The Lilliputian enigma at my feet disintegrated, resolved itself into its units, and raced toward that bridge. The spheres leading, they glided over it.

We saw a shaft of pale-blue phosphorescence piercing the murk. It was an unbroken span of the huge cubes, running over an abyss that gaped at my very feet. All of a hundred feet they stretched; a slender lustrous girder crossing unguessed depths of gloom. From far below came the faint whisper of rushing waters. . . . I faltered. For these were the blocks that had formed the body of the monster of the hollow, and its flailing arms. The thing that had played so murderously with the armored men. . . .

I felt a distinct shock from the object in my hand. My fingers flew open and released it. It fell, then skimmed over the floor and the bridging span like a swallow.

As though it had awaited this laggard, the end of the tiny bridge closest to us broke away from the edge of the fissure. It arose

(*Continued on page* 632)

www.americanradiohistory.com

Thrilling Battle Stories

Battles on Land, Sea and Air

Traffic Trouble

By RAOUL WHITFIELD

Allied planes strafe the enemy behind his lines. A story of exciting dog fights and daring flying.

Urge To Battle

By HAROLD BRADLEY SAY

Mopping up in the front lines. A great story of a slam-bang trench raid.

Read these Realistic Stories of the Army, Navy and Marines, in the Big Issue of November

Price **25c**

Battle Stories

On Sale Today

A Great ARTHUR GUY EMPEY Story

The famous author of "Over the Top" and other famous war time and battle stories has written another great tale exclusively for BATTLE STORIES Magazine. It is called M. P. CASEY, M. P.

Many other stories by the best writers of War-time fiction.

Red Decks

By JOHN WEBB

A powerful story of the sea. Yankee tars match their wits and courage against an enemy sub on the high seas.

Inside the Lines

By DOUGLAS NEWTON

One of those gripping, exciting kind of spy stories that keeps you in suspense until the last word. By a famous English writer.

And other great fight stories by CAPTAIN DAVIS JONES, J. R. JOHNSTON, F. C. PAINTON, ROBERT ANDERSON, CAPTAIN SHAW and L. C. GOLDSMITH.

(Sc.I.)

BATTLE STORIES MAGAZINE,
Robbinsdale, Minn.

Inclosed find $1 (bill or stamps), for which send me Battle Stories for the next five months. Or, inclosed, find 25c for one copy of the November issue.

Name .....

Address .....

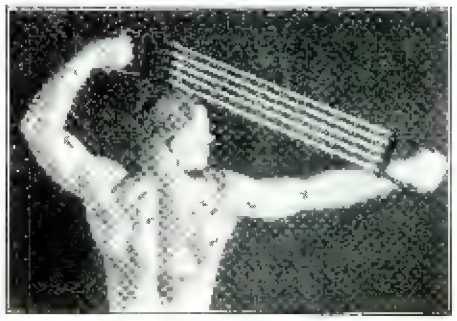
.....

.....

www.americanradiohistory.com

FREE

A 5-CABLE EXERCISER
AND
INSTRUCTIONS
With One Year's Subscription to
"Strength"
AT THE REGULAR PRICE



Here's a proposition, fellow, you can't equal—12 big issues of this magazine "Strength" sent to your home each month free of mailing charges and a 5 elastic cable exerciser with instructions on how to use it for developing your physical strength and bodily proportions as well as for improving your general health.

12 BIG ISSUES OF "STRENGTH"
AND THE
EXERCISER AND COURSE

only $2.50

The cables are all of the best rubber and are the strongest made. The grips are finely finished and strong. The instruction will give you exercises.

"Strength"

THE MAGAZINE FOR THE HEALTH, STRENGTH AND MUSCLE SEEKER

"Strength" is a he-man's magazine which contains articles and pictures upon all branches of the health, strength and muscular development subject. It shows you how to become healthier; how to increase your physical strength and how to improve your development and proportions.

There are loads of pictures each month of men who have acquired marvelous physiques and great strength through the methods outlined in this Magazine. There are pictures of beautifully formed women who have obtained their shapes through physical training methods. There are fight, baseball, field sports articles, etc., in each issue.

SEND YOUR NAME, ADDRESS and $2.50 NOW—We Pay All Charges

MILO PUB. CO., S. I. 10-27
2747 N. Palethorp Street, Philadelphia, Pa.

Gentlemen:

Please find enclosed $2.50 for which send me immediately a 5-cable exerciser and course free and enter my name on your mailing list for a year's subscription to "Strength."

Name .....

Address .....

City ..... State.....

The Metal Emperor

(*Continued from page 630*)

like a rod of metal until it stood upright on the farther side. It dropped.

Again the sibilant rustling, a glimmer of blue—and the things were gone.

My nerves tingled back to life. Drake was sitting up, his face bewildered.

"Did I dream it?" he gasped, "or did that infernal little What-is-it really knock me out?"

"It knocked you out," I said, grimly. "And to all intents and purposes it knocked me out, too."

"But, Good Lord—they were only bits of metal!" he whispered.

"It's what they looked like," I said.

"Bits of metal," he repeated, dazedly. "But damn it, Dr. Thornton—they were alive and thinking! They worked with each other as though they were human. Such little things—and with the kick of a dynamo. Metal—"

"Little things—babies!" said Ruth.

"Babies!" he echoed. "Metal babies—but if they could do what they did——"

"Exactly," I finished his thought. "You are wondering what the grown-ups could do. So am I."

"So purposeful, so deliberate," he arose, shakily. "Like whatever it was that broke the sun rays and snared the aurora. Like the mark—" he stooped, and scrutinized the stone where the thing had stood.

I bent. There upon the dust was a track, a tiny copy of the great mark upon the hill!

A chill passed through me, as though a door had opened into an unknown world, and out of it a cold wind had come.

"You're—you're frightened?" Ruth touched Drake's hand.

"Well——" he hesitated, "not exactly—frightened. But I've been a whole lot easier in my mind. And my sole ambition just now, Miss Ventnor, is to help get you out of the range of those—babies—and their families, quick. Come on, Professor."

He swung her over the fissure, and ran with her toward the shattered entrance. I followed him.

If Drake was not frightened, I have no shame in saying that I was. For what we had beheld in the dusk of the ruined chamber had been outside all experience, beyond all knowledge or dream of science.

Thor compressed in Hop-o'-my-thumb. The lightnings incarnate in metal corpuscles—and thinking. Metal given volition, movement, cognoscence.

Metal things with minds! Metal with a brain!

CHAPTER VI

THE SMITING THING

THE twilight was stealing upon the close-clustered peaks. Another hour, and their amethyst and purple mantles would drop upon them; snowfields and glaciers sparkle out for their moment of irised beauty, night would fall. As we hurried along I wondered, with deepening of that dread, to what secret place within their brooding immensities the metal mysteries had fled? And to what myriads, it might be, of their kind? And those hidden hordes—of what shapes were they? Of what power?

I turned aside, made my way out upon the ledge and looked over the haunted hollow. Unbelieving, I rubbed my eyes. A lark had risen from the top of one of the stones and had flown caroling up in to the shadowing sky. A flock of the little willow warblers flung themselves across the valley, scolding and gossiping; a hare sat upright in the middle of the ancient roadway and raised inquisitive ears.

The hollow itself lay serenely under the ambering light, smiling, peaceful—emptied of terror.

I dropped over the side, and walked cautiously down the road up which but an hour or so before we had struggled so desperately. Yes, gone was that soul of loneliness; utterly vanished the currents of despair that had striven to drag us down to death. The bowl was nothing but a quiet, smiling, lovely little hollow in the hills. I looked back. Even the ruins seemed to have lost their sinister outlines; they were time-worn, crumbling stones and nothing more.

I saw Ruth and Drake run out upon the ledge and beckon me. I stumbled up the side, and joined them.

"It's all right," I cried. "Get Martin and Chiu-Ming. Quick—while the way's open——"

From the portal scampered Chiu-Ming, his robe tucked up about his knees.

A rifle-shot rang out above us; another and another. Then Ventnor's shouting;

"Ruth! Thornton! Drake! Here! They are coming!"

$5,000 for Perpetual Motion

The editors have received thousands of different designs of perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stocks for these perpetual motion machines are being sold at a rate of $1.00 per share, although some inventors are trying to sell shares of stocks at $100.00 per share.

Therefore the editors of this publication say, "Just come in and show us—merely SHOW us—a working model of a perpetual motion machine and we will give you $5,000.00. But the machine must not be made to operate by tides, winds, waterpower, natural evaporation or humidity. It must be perpetual motion."

There was a flaming of spears high up the winding mountain path. Down it was pouring an avalanche of men. I caught the glint of helmets and corselets. Those in the van were mounted, galloping two abreast upon sure-footed mountain-ponies. Their short swords, lifted high, flickered like lightnings. After the horsemen swarmed foot soldiers, a thicket of shining points and dully gleaming pikes above them.

Again Ventnor's rifle cracked. One of the foremost riders went down, another stumbled over him. The rush was checked for an instant, milling upon the road.

"Drake," I cried, "rush Ruth over to the tunnel mouth. We can hold them there. I'll get Martin. Chiu-Ming, after the pony, quick"

I pushed the two over the rim of the stairway, and shouted to Ventnor.

"To me, Martin. Ruth and Drake are on their way to the tunnel we came through. Quick!"

I heard him empty his magazine with almost machine-gun quickness. There was a short pause, and down the broken steps he leaped, grey eyes blazing.

"My pony?" he ran beside me toward the portal. "All the ammunition is on him."

"Chiu-Ming's taking care of that," I said.

We darted out of the gateway. A good five hundred yards away were Ruth and

(*Continued on page 634*)

www.americanradiohistory.com

WHOLESALE PRICES

--- for Dealers, Community Set Builders, General Repairmen and Agents ---

Be sure to get this great 100-page book with net prices to the radio trade.
Radio Specialty Company is radio's oldest radio parts mail order house in the country, and the new confidential prices on standard radio merchandise are the lowest of any radio house.
We are ready now to appoint additional agents in all parts of the country. If you care contemplating making big money in radio merchandise, be sure to get in touch with us at once.

WHEN WRITING TO US, USE YOUR LETTERHEAD

1927 Edition
No. 17
500 Illustrations
NEW Enlarged Edition

THIS 100 PAGE RADIO CATALOGUE FREE

75 HOOKUPS

BUY!!

from Radio's Oldest Mail Order House

WE are the oldest established, exclusive radio mail order house in the country. Our motto is "Quick Shipment." All orders are shipped within 24 hours. Quick, prompt, courteous service. We carry a larger variety of radio parts and findings than any other radio house in the country.

"RASCO HAS IT"

If you are in need of certain small radio parts that other radio and mail order houses do not bother to carry, get the Rasco parts catalog and you will find them there, anything from a screw to copper ribbon and telephone diaphragms, as well as thousands of other small radio findings. Just to mention a few:

Lugs, nuts, dials, vernier dials, jacks, plugs every kind of knob, cords, panels, screws, sliders, washers, selenium, tinfoil, switches, crystals, cap nuts, Litz wire, cord tips, brass rods, resistances, name plates, spring binding posts, switch parts, metal ribbon, carbon balls, binding posts, all types, switch points, switch levers, lock washers, carbon grains, ground clamps, metal pointers, insulated tubing, low melting metal, antenna connectors, bus bar wire, as well as thousands of other articles.

We carry the Largest Variety of Small Radio Parts in the World.
BUT We also carry ALL standard radio merchandise.
ANYTHING IN RADIO

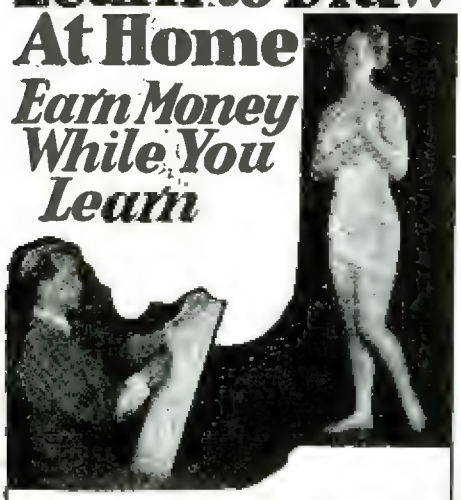
RADIO SPECIALTY CO.

100 PARK PLACE NEW YORK CITY, N. Y.

www.americanradiohistory.com

Learn to Draw At Home

Earn Money While You Learn



$100 a Week
Earned By Young Artist

"I am earning $100.00 a week" writes our graduate, P. C. Roberts, Fla. "Pretty good for a young man of twenty."

Graduate Wm. R. Kent, New Jersey, writes: "I have obtained $100.00 for a single drawing which only took a day to do."

Harold A. Allen, R. I., writes: "I have made $40.00 in a single day." Henry G. McIlvaines, Jr., Pennsylvania, writes that our training enabled him to obtain a desirable position as Artist with one of America's most prominent advertising agencies.

Earn While You Learn

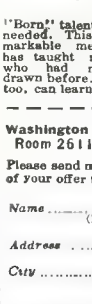
This course teaches you how to draw "pictures that sell," while learning. E. V. Fritsch, Texas, who had completed only one-third of the course wrote: "I earn $10.00 to $15.00 a day." Miss H. H. Hartleigh, Mass., writes: "I have made $235.00 and I've only sent in 12 lessons." David W. Gould, Maine, wrote, while learning: "I made $225.00 on one job."

Opportunities Everywhere

Over 50,000 Buyers of Drawings everywhere; such as over 4,000 Advertising Agencies; 12,000 Large Advertisers; 2,500 Newspapers; 2,400 Magazines; 25,000 Printers; 1,100 Book and Music Publishers; 700 Photo-Engravers; 3,000 Department Stores; 5,000 Art Stores. Retail Stores also use drawings for advertisements and display cards. No need to leave home—hundreds of buyers probably in your own section. And you can mail drawings to distant buyers.

What Art Buyers Say

An Art Editor writes: "Please furnish names of students in this vicinity." Another writes: "Advise a few of your best students to send us samples." A Magazine Publisher writes: "We are buying drawings from your graduates and undergraduates."



Send For Free Book

Handsomely illustrated free book tells how you can learn at home this way. It tells what our graduates earn; how they earned while learning. Tells of big markets for drawings and how our Students' Service Bureau operates to help capable students to sell drawings or obtain a position. Carl C. Thompson writes: "Through your aid I have been offered 25 different positions." Book is free. No obligation. No salesman will call. Mail coupon today.

"Born" talent not needed. This remarkable method has taught many who had never drawn before. You, too, can learn.

Washington School of Art, Inc.
Room 2611-E 1115 15th St., N. W.
Washington, D. C.

Washington School of Art, Inc.,
Room 2611-E 1115 15th St., N. W., Washington, D. C.

Please send me without cost or obligation your book also details of your offer to new students

Name .....
(Please write plainly, Mr., Miss or Mrs.)

Address .....

City ..... State .....

Please state age .....

The Metal Emperor

(*Continued from page 632*)

Drake, running straight to the green tunnel's mouth. Between them and us was Chiu-Ming, urging on Ventnor's beast. As we sped after him I looked back. The cavalry had recovered, they were now a scant half-mile from where the road swept past the fortress. In addition to their swords I saw that the horsemen carried bows. A little cloud of arrows sparkled from them; fell far short.

"Stretch yourself, Louis," grunted Ventnor. "There's a surprise coming. Hope to God I judged the time right. It'll hold 'em for a little while if I did——"

There was a thunderous booming behind us; a crashing. I whirled around. A cloud of smoke and dust hung over the northern end of the ruined fortress. It lifted, and I saw that one whole side had fallen, littering the road with its fragments. Scattered among them were men and horses. On the farther side of this stony dike our pursuers were held like rushing waters behind a sudden fallen tree.

"Come on!" cried Ventnor. "Timed to a second. Hold 'em for a while. Fuses and dynamite. Blew out the whole side, right on 'em, by the Lord!"

On we fled, Chiu-Ming now well in advance, Ruth and Dick less than a thousand feet from the opening of the green tunnel. Then Drake halted, raised his rifle and emptied it before him. Gripping Ruth by the hand, he raced back toward us. And as he turned, the vine-screened entrance, through which we had thought lay safety, was choked by other armored men. We had been outflanked.

"The crevice," shouted Ventnor. Drake heard, for he changed his course to the fissure at whose mouth Ruth had said the little metal things had lain. After them pattered Chui-Ming, urging on the pony. Out of the tunnel, down over the lip of the bowl, leaped the soldiers. Ventnor and I dropped upon our knees and sent shot after shot into them. They hesitated, and fell back. We sprang up and on.

All too short was the check, but once more we held them—and once again.

Now Ruth and Dick were a scant fifty yards from the crevice. He stopped, and pushed her from him toward it. She shook her head. And now Chiu-Ming was with them. Ruth sprang to the pony, and lifted a rifle from its back. Into the mass of our pursuers she and Drake poured a fusillade. They huddled, wavered, and broke for cover. But from behind us arose a wolflike yelping. The bulk of the pack had climbed the barricade the dynamite had made, and were rushing upon us.

We ran as I had never known I could run. Over us whined the bullets from the two covering guns. We were now close to the mouth of the fissure. But close, close were our pursuers, too.

"No use!" shouted Ventnor. "Three hundred yards—but we can't make it. Drop—and shoot."

We threw ourselves down, facing them. There came a triumphant shouting. And in that strange sharpening of the senses that goes always hand in hand with deadly peril, that is indeed nature's summoning of every reserve to meet that peril, my eyes took in the armored men with photographic nicety—the linked mail, lacquered blue and scarlet, of the horsemen; brown, padded armor of the footmen; their bows and javelins and short bronze swords, their pikes and shields; and under their round helmets their bearded faces—white as our own where the black beards did not cover them; their fierce eyes.

The human springs of ancient Persia's long dead power, these! Men of Xerxes's ruthless, world-conquering hordes; the lustful, ravening wolves of Darius whom Alexander scattered—in this world of ours twenty centuries beyond their time!

Swiftly, accurately, we had been drilling into them. They advanced deliberately, heedless of their fallen. Their arrows had ceased to fly. Clearly it was their intention to take us alive, at whatever cost to themselves.

"I've got only about ten cartridges left, Martin," I said.

"We've saved Ruth," he answered. "Drake ought to be able to hold that hole in the wall. He's got lots of ammunition on the pony. But they've got us—I'm sorry, old man."

Another wild shouting, and down upon us howled the pack. We leaped to our feet, sent our last bullets into them, and stood ready, rifles clubbed, to meet the rush.

What was the matter with the armored men? They had stopped. At the same moment, the rifle fire of Ruth and Dick had ceased. We swung around to look at them—and stood, as motionless as those who had pursued us.

Within the black background of the fissure stood a woman.

Norhala stood upon its crest. . . . She had cast her veils from her. Her naked arms were lifted to the sparkling skies, and all her bared body was outlined in living light. Light filled her, light streamed from her as though she were a crystal vase fashioned in woman's form. She was singing; we heard like faint chimes on golden bells the echoes of her song. . . .

Swathed from chin to feet in clinging veils of pale amber, she seemed taller even than tall Drake. Yet it was not her height that had sent through me the thrill of awe, which, relaxing my grip, had let my smoking rifle drop to earth; nor was it that about her head a cloud of shining tresses swirled and pennoned like a misty banner of woven copper flames—no, nor that through her veils her body gleamed with faint radiance.

It was her eyes—her great, wide eyes whose clear depths were like pools of star flame. They shone from her white face as though within them were the cold white flames of the far stars themselves—and as calm as those stars. And in the face, although as yet I could distinguish nothing but the eyes, I sensed the unearthly.

The woman stepped out of the crevice. Fifty feet from her were Ruth and Drake and Chiu-Ming, staring at her.

www.americanradiohistory.com

She beckoned to them. Ruth ran to her, Drake covering her; Chiu-Ming did not move. Her eyes fell upon Ventnor and myself. She raised a hand, and motioned us to approach.

I cast one glance at the host that had poured down the mountain road, horsemen, spearsmen, pikemen—a full thousand of them; took in at my right the scattered company that had come from the tunnel entrance, threescore or more. They stood like automatons.

"Quick," breathed Ventnor.

We ran toward this—woman—who had checked death even while its jaws were closing upon us.

As though our flight had broken whatever spell had bound them, a clamor arose from the host; a clanging of swords on shields. I shot another glance behind. They were in motion, advancing again, slowly, hesitatingly as yet—but I knew that soon that hesitation would pass.

The woman threw up her head. The cloudy metallic hair billowed as though wind had blown it. It seemed to flash. From the lifted throat came a vibrant cry, harmonious, weirdly disquieting, golden and sweet. Before the cry had ceased there poured with incredible swiftness out of the crevice score upon score of the metal things.

Station
WRNY
NEW YORK
309.1 Meters—970 Kilocycles
is owned and operated by the publishers of this magazine
Our Editors will talk to you several times every week—
See your Newspaper for details
TUNE IN ON WRNY

Globes and cubes and pyramids—not small like those of the ruins, but shapes all of four feet high, dully lustrous, and deep within that luster the myriads of tiny points of light like unwinking, staring eyes—the fissure vomited them. They swirled, eddied—and swept down. They formed a barricade between us and the armored men.

A shower of arrows met them. The horsemen charged. They had courage—those men—yes!

Again came the woman's cry—golden, peremptory.

Sphere and block and pyramid ran together, seethed; once more I had the sense of quicksilver melting. Up from the mass thrust a thick and rectangular column, eight feet in width and twenty high. Out from its left side, from right side, sprang three arms—three arms tht grew and grew as globe and cube and angle raced up the column's side and clicked into place each upon the other.

And now before us stood a monstrous pillar, a geometric prodigy. Two great globes surmounted it. At left and right the incredible knobbed arms, fully fifty feet in length, writhed and twisted, flexing themselves in grotesque imitation of a boxer. At the end of each of the six arms the spheres were clustered thick and studded with the pyramids—dreadful parodies of the knobbed throngs for the hands of those ancient gladiators who fought before the Caesars.

(*Continued on page* 640)

You Fellows Who Want BIG PAY Get into ELECTRICITY

WHY earn $15 or $20 or $30 a week, when in the same six days as an Electrical Expert, you can make $70 to $200—and do it easier—not work half so hard. Why, then, remain in a small-pay, no-future job that offers no chance for big promotion—no chance for big income? Fit yourself for a real job. **Get Into Electricity.** That's where the big money is being made, and always will be made.

Electricity—The Big Pay Field

Today even the ordinary Electrician—the "screw driver" kind—is making money—big money. But it's the trained man—the Electrical Expert—who makes the really big money,—$12 to $30 a day—$70 to $200 a week. Be a Big-Pay man, yourself. Get in line, **now**, for one of these "Big-Pay" Jobs.

I'll Train You at Home

I'll train you at home—in your spare time. You work just as you are working now—at your same job. My now famous "Work-Sheet and Job-Ticket" method, guarantees you simplified, practical training along work-shop lines. In a few short months you can step out of your old job into a new job—into electrical work where you can be a Big-Pay man in this Big-Pay field.

You Earn as You Learn

To learn Electricity my way you don't have to be a College man, or even a High School graduate. You can read. You can write. That's enough. With me, you get experience as you go along and make good money while learning. I'll show you how,—and I'll give you, without extra cost tools and apparatus to work with—6 Big Outfits in all.

Money Back if not Satisfied

That's what I agree to do. And back of me in this agreement stands the Chicago Engineering Works, a $2,000,000 Illinois Corporation. There's nothing like "Cooke" Training, anywhere. It's the Training that big Electrical men are praising; it's the Training that employers recommend; it's the Training that one of our greatest Engineering societies, has endorsed 100 percent. **It's the Training for you.**

If You're Earning Less Than $70 A Week—Investigate

Don't wait a minute! Find out today why "The Cooke Trained man is the Big-Pay Man," everywhere! Find out how "Cooke" Training will help you boost your pay! Mail coupon right now for my Big FREE Book of Facts. See the Six Big Working-Outfits I give you without extra charge. See the hundreds of pictures, the proofs, the Big-Pay letters of other "Cooke" Trained Men. Get this great free Book. Send for it today. Clip, sign, and mail coupon RIGHT NOW!

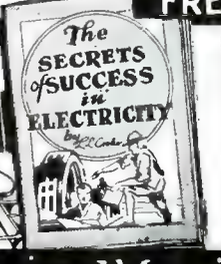
L. L. COOKE, Chief Instruction Engineer
L. L. COOKE SCHOOL OF ELECTRICITY
Dept. 28
2150 Lawrence Ave.
Chicago, Illinois

Hundreds of Men I have trained are now earning $70 to $200 A WEEK

$30 A DAY. I was making $25 a week when I enrolled. Now I make as high as $30 a day. A. J. Daigneault, 225 Worcester, Southbridge, Mass.

$1.50 AN HOUR. I had to work for 45c an hour before I enrolled. Now, thanks to you, I make $1.50 an hour. G. W. Oprea, 4220 N. Meade Av., Chicago, Illinois.

If you earn less than $70 a week INVESTIGATE ACT NOW



FREE BOOK COUPON

L. L. COOKE, Chief Instruction Engineer, Dept. 28, 2150 Lawrence Ave., Chicago, Ill.
Send me FREE your Big Book "Secrets o Success in Electricity," with all details abou your Home Study Course in Electricity.
Name .....
Address .....
City ..... State.....
Residents of Canada send coupon to R. A. Farrow, Special Representative, 7 Medbury Lane, East, Windsor, Ontario, Canada.

The "Cooke" Trained Man is the "Big Pay" Man

www.americanradiohistory.com

PATENTS

TRADE-MARKS—DESIGNS
FOREIGN PATENTS

MUNN & CO.
PATENT ATTORNEYS
Associated since 1846 with the Scientific American

SCIENTIFIC AMERICAN BUILDING
24 West 40th Street
New York City

SCIENTIFIC AMERICAN BUILDING
Washington, D. C.

TOWER BUILDING
Chicago, Ill.

HOBART BUILDING
San Francisco, Cal.

VAN NUYS BUILDING
Los Angeles, Cal.

Books and Information on Patents and Trade-Marks By Request

Associates in all Foreign Countries

PATENTS

TO THE MAN WITH AN IDEA

I offer a comprehensive, experienced, efficient service for his prompt, legal protection and the development of his proposition.

Send sketch, or model and description, for advice as to cost, search through prior United States patents, etc. Preliminary advice gladly furnished without charge.

My experience and familiarity with various arts frequently enable me to accurately advise clients as to probable patentability before they go to any expense.

Booklet of valuable information and form for properly disclosing your idea, free on request. Write today

RICHARD B. OWEN, Patent Lawyer

164 Owen Building, Washington, D. C.
41V Park Row New York City

TRADE-MARKS
REGISTERED

PATENTS As one of the oldest patent firms in America we give inventors at lowest consistent charge, a service noted for results, evidenced by many well known Patents of extraordinary value. Book, Patent-Sense, free. Lacey & Lacey, 644 F St., Washington, D. C. Estab. 1869

Patent Advice

Edited by
Joseph H. Kraus

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

No questions are answered this month owing to Mr. Flam's article.

Patent Litigation

By JOHN FLAM
Patent Attorney

PATENTS are often considered as tremendous weapons in the hands of a manufacturer to stave off competition; but many do not know the legal steps whereby such weapons are used. For example, inquiries such as the following are often encountered: What are the steps in the legal adjudication of a patent? What if any effect does the decision have? How can a "mere" layman (modest fellow!) be expected to know the significance of such outlandish terms, as "certiorari"; "stare decisis," "res adjudicata" and others? I wisely refrain from extending the list in consideration of personal safety, as I know that a "mere" layman's patience has limits just like that of ordinary human beings.

But to return to our discussion. A patent being granted by the Federal Government, our friend, the "mere" layman supposes (and, naturally, erroneously, as all "mere" laymen must) that it can be adjudicated in a single litigation (if carried far enough) so as to have an adjudication that applies to the entire territory of the United States. Due to the structure of the Federal Judicial system, this cannot occur except in extremely rare instances. The reasons will become apparent if we understand this judicial system.

Even a "mere" layman knows that there are courts, established in accordance with the laws of the states where they are sitting, which have powers to decide and rule on questions involving property of all sorts, contracts, and crime. The framers of the constitution realized however that there may be questions of a Federal nature, applicable to all the States, that can best be adjudicated independently of the state courts. Such questions, for example, are those relating to treaties, the duties of Federal government officials, interstate commerce, and the interpretation of constitutional provisions and of grants under authority of the constitution, such as prohibition, patents and copyrights.

For the sake of convenience, then, the country is divided into nine circuits. For example, the Second Circuit includes New York State and Connecticut. The Ninth Circuit includes the Pacific coast states, as well as Montana, Idaho, Nevada and Arizona. Each circuit is further subdivided into numerous districts; for example, in the State of California there are two districts, a northern and a southern district. The district is the real unit of division, for each district judge is assigned to a definite district, although such a district may for convenience be divided into divisions. Of course there may be more than one judge to a district, the number depending upon the volume of litigation. For each circuit there are a number of Circuit judges who have the power of reviewing certain classes of cases decided by district judges in the circuit. The Supreme Court, in turn, has the power of reviewing certain classes of cases decided by the district judges or by the circuit judges. The Supreme Court is actually "supreme," for there can be no recourse to any other court after it has rendered a decision. It is evident that a ruling by the Supreme Court on a patent is greatly to be desired; but the question is, how to get the patent before this court?

Before tracing the progress of a patent through its stages upward toward the Supreme Court, it is well to remark here that we are now assuming that a patent has been regularly granted upon application to the Patent Office; and that the litigation we are now considering is separate and distinct from actions in courts sometimes necessary to ensure the issuance of the patent.

Very well then; our "mere" layman has his patent. He believes that the John Doe Manufacturing Co. is infringing his patent, and his lawyer decides to bring suit. Accordingly a suit is started in a District Court where the infringement is being committed. The defendant has in general two main defenses—non-infringement and invalidity of the patent, either of which if proved is sufficient for him to win the case. The Judge after due consideration, holds, let us say, that the patent is invalid. This is quote often the case, for the presumption of validity of a patent can be rebutted, for example, on a proper showing that the invention covered thereby was in public use prior to the date of invention of the applicant.

The patentee has the statutory rights to appeal to the Circuit Court of Appeals in that circuit where the infringement took place. This court, say, affirms the lower court. Is there no other recourse by way of further appeals? In general, there is none. However, the patentee can petition the Supreme Court to review the case, but he has no *right* to demand such a review. The Supreme Court, however is very chary about granting such petitions, and follows definite rules with respect to these matters. For example, it might grant the petition if it were convinced that the litigation was of great importance to a large number of people, or of national importance. But almost exclusively, the only sure way to get the Supreme Court to consider the patent case is in the circumstance that the patent has been held valid by one Circuit Court of Appeals, and invalid by another Circuit Court of Appeals. In other words, the petitioner must convince the Supreme Court that his patent is valid in one circuit and invalid in another, before the Supreme Court will take the trouble to consider the case.

Now consider what this means. The patentee has already had his patent adjudicated and held invalid in *one* circuit; he must now try to find an infringer in *another* circuit and to get a ruling of validity. He must keep on trying until he can obtain a conflicting decision. It is possible that he never can obtain such a decision; or else only after many years.

Even upon such a conflict, the Supreme Court narrowly scrutinizes the petition to find if possible, a good reason for refusing it. For example, it refuses the petition where in one circuit the defendant was held to infringe, and in another, not to infringe, and where there was no ruling as

(*Continued on page* 638)

INVENTORS PROTECT YOUR IDEAS

Send for our Guide Book, HOW TO GET A PATENT, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or sketch and description of your invention for INSPECTION and INSTRUCTIONS FREE. TERMS REASONABLE. BEST REFERENCES.

Name .....
Street .....
City .....

RANDOLPH & CO.
Dept. 172, WASHINGTON, D. C.

www.americanradiohistory.com

PATENTS

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ.

All drawings and specifications are prepared under my personal supervision.

My Patent Law Offices Just Across Street From U.S. Pat. Office

Protect Your Ideas

Take the First Step Today—Action Counts

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon below.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trademark cases . Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

Strict Secrecy Preserved—Write Me in Confidence

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. Your case will have my personal attention. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.

No Charge for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will send you my "Record of Invention" form, on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

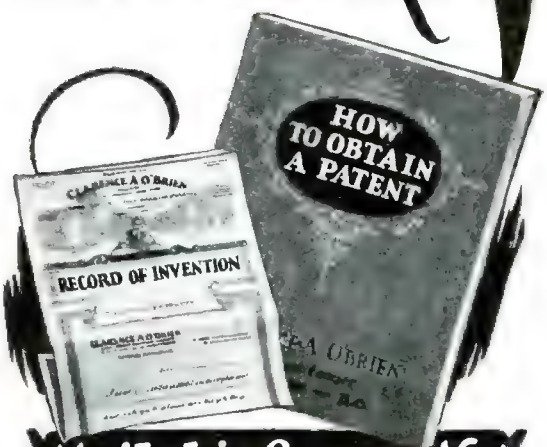
Clarence A. O'Brien

Registered Patent Attorney

Member of Bar of: Supreme Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims.

PRACTICE CONFINED EXCLUSIVELY TO PATENTS, TRADEMARKS AND COPYRIGHTS

Inventors *Write for these* Free Books



Mail this Coupon *Now*

CLARENCE A. O'BRIEN
Registered Patent Attorney
531 Security Savings & Commercial Bank Bldg., Washington, D. C.

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name .....

Address .....

(Important: Print or Write name clearly)

www.americanradiohistory.com

Washington Monument in the Nation's Capital

PATENTS

DON'T LOSE YOUR RIGHTS TO PATENT PROTECTION

Before disclosing your invention to anyone send for blank form "EVIDENCE OF CONCEPTION" to be signed and witnessed. As registered patent attorneys we represent hundreds of inventors all over the United States and Canada in the advancement of inventions. The form "Evidence of Conception," sample, instructions relating to obtaining of patents and schedule of fees sent upon request.

LANCASTER & ALLWINE
255 Ouray Building
WASHINGTON, D. C.
Originators of forms "Evidence of Conception."

1000 NEEDED INVENTIONS

Here is the most remarkable book ever offered to inventors. One Thousand needed inventions listed and described. Arranged as follows: General Problems; Automotive; Mechanical; Electrical; Chemical; Radio; Marine. Separate chapter on the Ten Most Needed Inventions. This book may give you one idea that will win you a fortune. Nothing else like it has ever been published. Compiled at enormous expense. Edited by Raymond Francis Yates, formerly Managing Editor of a leading scientific magazine. Over 100 pages durably bound. Send only $1.25 (nothing more to pay) and your copy of this remarkable book will be sent immediately. (*Outside U. S.* $1.45.) Money back after 10 days' examination if desired. Limited edition. Write NOW.

BUREAU OF INVENTIVE SCIENCE
Dept. 711 Rochester, New York

Inventors Service Bureau

Prepares and files applications for patents. Makes patent searches. Negotiates sales of patents. A complete service for the inventor. Low rates. Easy terms. Write for particulars.

Box 1648 Washington, D. C.

INVENTIONS Commercialized

ON A CASH OR ROYALTY BASIS
PATENTED or UNPATENTED
In Business 25 Years · Complete Facilities · References.
Write ADAM FISHER MFG. CO.
205D Enright Ave. St. Louis, Mo.

INVENTORS

IDEAS DEVELOPED AND PERFECTED
Models, Experimental work; labor-saving machinery for manufacturers. 20 years' experience.
Bernard & Heller, 275-B Water St., N.Y.C.

BLUE BOOK ON PATENTS

and Priority Record blank gratis.
MONROE E. MILLER, PATENT LAWYER,
411-6 Ouray Building, WASHINGTON, D. C.
ELECTRICAL AND MECHANICAL EXPERT

Patent Advice

(*Continued from page 636*)

regards validity. In other words, the Supreme Court is most interested in having a Government grant, such as a patent, uniformly construed in all circuits, and is not so much interested in the particular cases or litigants. Once the Supreme Court has made its ruling on the patent however. it applies to *all* circuits, even if it be too late to help in cases long decided by the Courts of Appeal.

It is thus seen that until such a ruling, the patent can be valid in one circuit and invalid in another. Such situations are not so common as one would suppose; because usually a ruling by one tribunal is most apt to be followed by another tribunal; that is, comity is expected to apply to all Circuit Courts of Appeal.

Nevertheless, a conflicting ruling can be obtained by showing at the trial or on argument that the older ruling was based on a clear error, or by introducing clear and convincing testimony additional to that considered in the older case. It must be understood that this privilege exists only when the new case is between *different* parties. Thus if a new suit in a different circuit is brought on the same patent between the *same* parties, the holding as regards *validity* and *scope* of the patent *must* follow the old holding. This is the doctrine of "res adjudicata," which simply means that when a controversy is once settled between two litigants, it *stays* settled even in other circuits. Of course, the question of *infringement* can be argued over again, in case the alleged infringing device is different from that considered in the earlier case. And, of course, even the question of validity can be brought up again *between other litigants*, for each litigant is entitled to his "day in court."

Since many patents, especially radio patents, are highly technical in character, it is not at all surprising that the judges make mistakes. After all, judges are human and it is perhaps too much to expect in them, both profundity in law as well as in science. Yet there are a few outstanding exceptions; the most important being Chief Justice Taft of the Supreme Court, who undoubtedly has one of the most capable minds in analyzing patent situations, and of course, he is an intellectual giant in the realm of law. For a long period he was a Federal District Judge in Ohio, and many of his old decisions are still considered valuable guides.

It has often been suggested to take a group of Federal judges having special aptitude for patent matters to form a court of patent appeals, and to make it possible to appeal in all patent cases to this court, instead of attempting the well-nigh impossible feat of having the Supreme Court consider the case. Such an appellate tribunal could pass on patent matters to affect the entire country, not only one circuit, as in the case of the Circuit Courts of Appeal. There has been considerable agitation to effect this, and I believe that sooner or later, the Court of Patent Appeals will be not merely a vision, but a reality. It would undoubtedly make for speed and justice in patent matters.

The law of patents is now fairly well fixed; and it is for this reason that the Supreme Court feels it to be an unnecessary burden to consider such cases. Originally, when the Supreme Court was organized, cases involving patents could be taken up as a matter of right; and as a result, we have many ably considered Supreme Court decisions serving as guides in patent cases. Then later the right to appeal to the Supreme Court was taken away, due to the large volume of litigation awaiting Supreme Court action; and only about a year ago, the appellate jurisdiction of the Supreme Court was still further curtailed.

The situation then is that a litigant, whose case involves patents, has a long and arduous road to travel before he can hope for a review by the Supreme Court. When it is considered that bootleg cases now clutter up the Federal courts to an extent that it tries the patience of even the most phlegmatic judge, and that other types of litigation have also greatly increased in volume in the past decade, it is not at all surprising that sometimes years pass before a district judge can render his opinion. Then, after that, there are more delays, in preparing appeals, docketing and arguing the case before the Circuit Court of Appeals; then going through the same process in other circuits to arrive at substantial uniformity or conflict; and in the latter case, petitioning the Supreme Court for a review (technically termed "petition for a writ of certiorari") and then following the case through the Supreme Court.

In the scope of this article, it is manifestly impossible to enter into great detail regarding numerous steps needed not only to stop an infringer, but also to recover from him his ill-gotten gains. In order to recover from him, an accounting is usually necessary, which almost always is under the supervision of a "master" appointed by the Court after the question of infringement is determined. A point often asked by our old friend, the "mere" layman, is: how extensive is the accounting; and to what extent must the infringer be held liable?

In the first place it is necessary to give notice

A Personal Service for

INVENTORS

I maintain an unexcelled organization and thoroughly equipped laboratories, to render the following services.

I PREPARE APPLICATIONS for patents for filing in the United States and foreign countries.

I PLACE INVENTIONS with responsible manufacturers, with whom I am acquainted, under arrangements that are made profitable to the inventor.

I SPECIALIZE in Electrical, Mechanical, Chemical, and Radio Devices.

I INVITE CORRESPONDENCE with reputable inventors, Scientists, Chemists and Physicists, regarding their inventions and uncompleted experiments.

H. R. VAN DEVENTER
Licensed Professional Engineer
Registered Patent Attorney
342 Madison Avenue, New York City

C. L. PARKER

Ex-Examiner U. S. Patent Office
Attorney-at-Law and Solicitor of Patents
McGill Building, Washington, D. C.
Patents, Trade Mark and Copyright Law

PATENTS

BOOKLET FREE HIGHEST REFERENCES
PROMPTNESS ASSURED BEST RESULTS
Send drawing or model for examination and advice.
WATSON E. COLEMAN, Patent Lawyer
724 9th Street, N. W., Washington, D. C.

NEW YEAR - NEW IDEA
PATENT YOUR IDEAS
Call or send me a sketch of your invention. PhoneLONgacre 3088
FREE Inventors Recording Blank Confidential Advice
U. S. and Foreign Patents secured by
Z.H.POLACHEK Reg. Patent Attorney Consult. Engineer
1234 Broadway, New York

A HANDY BINDER

for Your Issues of
SCIENCE and INVENTION

ONLY
65c

SIXTY-FIVE CENTS keeps your back issues of "Science and Invention" in neat, orderly array. Keeps them clean, fresh and ready for instant reference at any time. Our new Binders, made especially for "Science and Invention," are of sturdy, stiff material that will last a lifetime. By quantity buying we have lowered the price to only 65c.

Each binder will hold twelve issues comfortably—a full year's edition. They are ready for sale now.

ORDER NOW

Experimenter Pub. Co., Inc.
230 Fifth Ave., New York, N. Y.

www.americanradiohistory.com

to the infringer, and the accounting period runs only from the date of such notice. The notice can be given in two ways: the first, by actual notice that he is infringing the patent, identifying it by number and date, with an admonition to desist. The service of the papers on the defendant in a patent suit is of course adequate if no other prior notice was given him. The second way of giving notice is by marking the patented device sold under the patent claimed to be infringed, with the patent date. This is constructive notice to everyone of the existence of the patent. Obviously, this mode of giving notice is not possible in case the patent is not being exploited commercially, and under such circumstances, actual notice to the alleged infringer is required before the accounting period starts.

At the discretion of the Court, the accounting can include either the profits obtained by the infringer due to his infringing acts, or the damages that the patentee sustained thereby. It is also possible for the Court to decree triple damages as a penalty for wilful infringement. Sometimes the accounting shows a very large sum due to the plaintiff. In one case, involving a transformer patent, the Wagner Electric Company was held entitled to collect over $200,000 from the defendant, the Westinghouse Company. It is now rumored that the old miner, Carson, who won his suit against the copper smelting interests on his smelting process patent, will be able to recover many millions of dollars. Needless to say, these reports are gross exaggerations, and Carson would probably be willing to take much less.

This article makes no attempt to cover the fine points of Federal Court procedure in patent matters, nor does it touch at all upon the procedure that takes place in the Patent Office prior to the issuance of the patent.

Odd Uses of Mica

Among miscellaneous uses are its application for ornamental uses—particularly in India—as a dressing for wounds and as a substitute for canvas in portrait painting. A demand for very large sheets capable of supplying 18-inch circles has been noted. These large mica sheets are used as a base on which scenes are painted for projection upon the stage.

Mica splittings consist of thin flakes split from the smaller sheets or from waste fragments. They are used chiefly for the manufacture of built-up mica board. This built-up board is produced from alernate layers of splittings and shellac or other binder. The finished board is baked under pressure and machined to desired dimensions. Built-up board is produced from alternate layers ments, and in various forms in dynamos, motors, and transformers.

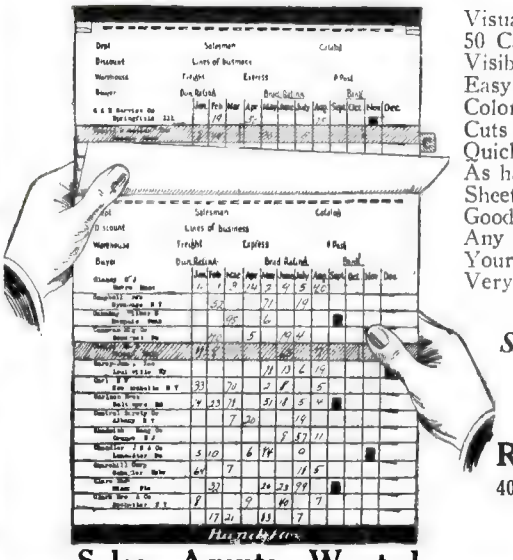
One of the largest uses of dry-ground mica is in the preparation of rolled roofing and asphalt shingles, where it is employed to prevent sticking between adjacent surfaces. Coarsely ground mica is used extensively for ornamental purposes, particularly for "Christmas tree snow," which is sold in considerable tonnages at holiday time. It is also used for the surfacing of stucco and concrete to imitate granite. Its use has also been reported for annealing steel, as a component of explosives, in calico printing, in paints and as an inert filler.

Wet-ground mica is in demand by the manufacturers of wallpaper for the decoration of papers where it is desired to bring out a lustrous pattern. Considerable ground mica is consumed in the manufacture of auto tires where it is employed as a lubricant. The hard-rubber industry also uses some ground mica. Mica mixed with greases is used in the preparation of special lubricants for metal bearings.

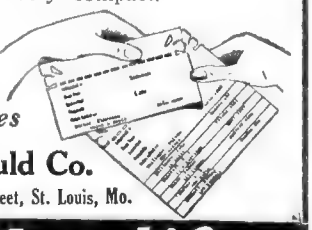
The dominant position of India in the mica industry is maintained by its large reserves of mica of good quality, and an unfailing supply of cheap labor. Mica is produced also in Canada, Madagascar, Union of South Africa, Rhodesia, Tanganyika Territory, Argentina, Brazil, and Guatemala.

Further details in regard to the mica situation are given in Information Circular 6044, by W. M. Myers, mineral technologist, copies of which may be obtained from the United States Bureau of Mines, Department of Commerce, Washington, D. C.

SHEETS OF CARDS
make Speedy Visible Records
Handifax—A Wonderful Invention—Helps Business



Visualizes recorded facts to executives.
50 Card-sheets show 1000 cards.
Visible space on each card ½ or 1 inch.
Easy to analyze graphic chart "picture."
Color signals "flag" your attention.
Cuts record-keeping costs 40%.
Quick for use in reference or posting.
As handy to use as a sheet of paper.
Sheets of cards can be typewritten.
Good for all kinds of records.
Any size, 100, 1,000, 10,000, 1,000,000.
Your present system can be used.
Very low cost—very compact.



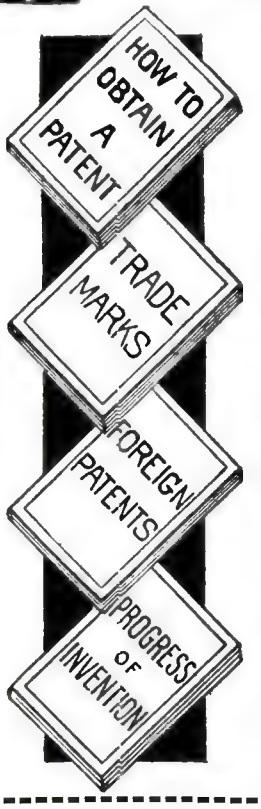
Send for FREE Samples

Ross-Gould Co.
404 N. Tenth Street, St. Louis, Mo.

Sales Agents Wanted

Handifax

PATENTS TRADE-MARKS AND COPYRIGHTS



OUR OFFER: FOR THE PROTECTION OF YOUR INVENTION

YOUR FIRST STEP. The inventor should write for our blank form—"RECORD OF INVENTION." This should be signed, witnessed and returned to us together with model or sketch and description of the invention for INSPECTION and INSTRUCTIONS FREE!

Our Four Books Mailed Free to Inventors

Our Illustrated Guide Book
HOW TO OBTAIN A PATENT
Contains full instructions regarding U. S. Patents. Our Methods. Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE-MARK BOOK
Shows value and necessity of Trade-Mark Protection. Information regarding *Trade-Marks and unfair competition in trade.*

OUR FOREIGN BOOK
We have Direct Agencies in Foreign Countries and secure Foreign Patents in shortest time and lowest cost.

PROGRESS OF INVENTION
Description of World's Most Pressing Problems by Leading Scientists and Inventors

All Communications and Data Strictly Confidential. Interference and Infringement Suits Prosecuted.

IMPORTANT
TO MAKE YOUR CASE SPECIAL AND AVOID DELAY YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to secure protection, save correspondence and obtain early filing date in Patent Office. To secure special preparation of your case send $25.00 on account with model or sketch and description of your invention.

Highest References—Prompt Attention—Reasonable Terms

WRITE TODAY

FREE COUPON

VICTOR J. EVANS & CO.
Registered Patent Attorneys
MAIN OFFICES: 645 Ninth St., Washington, D. C.
New York Offices, 1007 Woolworth Bldg.; Philadelphia Offices, 518-519 Liberty Bldg.; Pittsburgh Offices, 514 Empire Bldg.; Chicago Offices, 1114 Tacoma Bldg.; San Francisco Offices, 1010 Hobart Bldg.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name .....

Address .....

www.americanradiohistory.com

WHAT IS A BAR BELL?

A Bar Bell is simply a long-handled dumb-bell. It has many advantages over a pair of dumb-bells. For instance, it is far easier to handle a 50-pound bar bell than two 25-pound dumb-bells. Again, with a bar bell you can do certain back and leg exercises where it would be awkward to handle a pair of dumb-bells. The bar bell became

THE GREATEST OF ALL BODY BUILDERS

when the adjustable feature was added—for then it became possible to employ the progressive method of exercise which has proven to be the only way in which a man of below average physique can gradually but steadily improve his build, his muscular development and his stock of organic vitality until he becomes a physical superman—the very pattern of health, strength and manly beauty.

A MILO PUPIL

By Using a Bar Bell You Can Become a Physical Superman

With every bar bell we sell we give courses in training to suit the individual purchaser. Our pupils vary in age from fourteen years to as old as sixty-four. We have seen slender young pupils gain as much as *twenty pounds* in weight, and *six inches* in chest measurement in the first six weeks they were under our training. We have taken stout middle-aged parties and shown them how to regain the fine proportions, the elasticity and the vigor of athletic youth. We get orders from hundreds of business men and office workers, and we show them how it is possible to get the greatest possible results in the shortest possible time. (Possibly forty per cent of our patrons are indoor men.) One of our greatest delights is taking husky farmers, outdoor workers and gymnasium devotees and showing them what *real* strength and development are like. Every case is individual with us and we have handled so many different kinds of health-seekers, shape-seekers, and strength-seekers that it is hardly possible *your* case would present any new problems for us.

We Give Unlimited Service

With us it is not a case of giving you so many "lessons" and then forgetting you. You are our pupil as long as you own the bar bell you buy from us. You may be in such condition that we can give you the kind of developing work that makes you gain at a rate so rapid that you will be amazed. Or it is possible that you are in such a run-down or absolutely undeveloped state that we will have to start you with the bell adjusted to very moderate weights, put you on a mild progressive schedule, and *coax* your body to its proper proportions and teach you how to accumulate a stock of reserve vigor and health. All of which is part of our job, and what you pay us for.

We Give An Absolute Guarantee

All our goods are sold on the same understanding. If within ninety days after enrolling you are not satisfied with the results, you can return your outfit and have your money refunded. For years we have kept a careful record and find the proportion of returns is 1/3 of 1 per cent. In other words, we satisfy 299 out of every 300 customers. (We never expect to be perfect.)

Our Literature Will Interest You

Send at once for our booklet,

"Health, Strength and Development and How to Obtain Them"

The Milo Bar Bell Co.

2739 North Palethorp St. Philadelphia, Pa.

THE MILO BAR BELL CO.,
Dept. S. I. 11-27, 2740 N. Palethorp St.,
Philadelphia, Pa.

Gentlemen:
Please mail me, without charge or obligation on my part, your free booklet, "Health, Strength and Development and How to Obtain Them."

Name .....

Address .....

City..... State.....

The Metal Emperor

(*Continued from page* 635)

So for an instant it stood, a chimera, testing itself like an athlete under the darkening sky, in the green of the hollow, the armored hosts brazen before it—

And then—it struck.

Out flashed two of the arms with a glancing motion and an appalling force. They sliced into the close-packed forward ranks of the armored men; cutting out of them two great gaps. A third arm javelined from its place like a leaping snake, clicked at the end of another, and became a hundred-foot chain which swirled like a gigantic flail through the huddling mass. Down upon a knot of soldiers a fifth arm drove with a straightforward blow, crushing them.

Then all that host which had driven us from the ruins threw down swords, spears and pikes and fled shrieking. The horsemen spurred their mounts, riding over the footmen who fled with them. They scattered, running singly, by twos, in little groups, for the sides of the valley. They were like rats scampering in panic over the bottom of a great green bowl.

The smiting thing swirled, and took new form. Where had been pillar and flailing arms was now a tripod thirty feet high, its legs alternate globe and cube and upon its apex a wide and spinning ring of sparkling spheres. Out from the middle of this ring stretched a tentacle—writhing like a serpent of steel, four-score yards at least in length. At its end cube, globe and pyramid had mingled to form a huge trident. With the three long prongs of this trident the thing struck, swiftly, with fearful precision—joyously—tining those who fled, forking them, tossing them from its points high in air.

From half its length the darting snake streamed red rain.

I heard a sigh from Ruth. She lay fainting in Drake's arms. Beside the two the swathed woman stood, looking out upon the slaughter, calm and still, viewing it with eyes as impersonal, cold, and indifferent as the stars that look down upon hurricane and earthquake in this world of ours.

There was a rushing of many feet at our left; a wail from Chiu-Ming.

$21,000.00 for Spirits

Dunninger, who writes exclusively for SCIENCE AND INVENTION Magazine and who is the Chairman of our PSYCHICAL INVESTIGATION Committee will personally pay $10,000.00 to any medium or spiritualist who can present any psychical manifestation in so-called spiritualism, that he will not explain or that he cannot reproduce by natural means.

More than two years ago SCIENCE AND INVENTION Magazine offered a prize of $11,000.00 to anyone who could demonstrate his or her ability to communicate with the spirits or to give some definite form of a psychical demonstration which in itself was not trickery.

The result has been that mediums and spiritual organizations have been afraid to place proofs before us. Those weak attempts which have been made to demonstrate psychical phenomena were almost instantly proven fraudulent, and no medium has dared to contradict our findings.

In view of these facts, should we not consider all mediums fraudulent?

To the $10,000.00 which has been offered by Joseph F. Rinn through this publication for Spiritual proofs and the $1,000.00 in addition offered by SCIENCE AND INVENTION Magazine we now add Dunninger's $10,000.00.

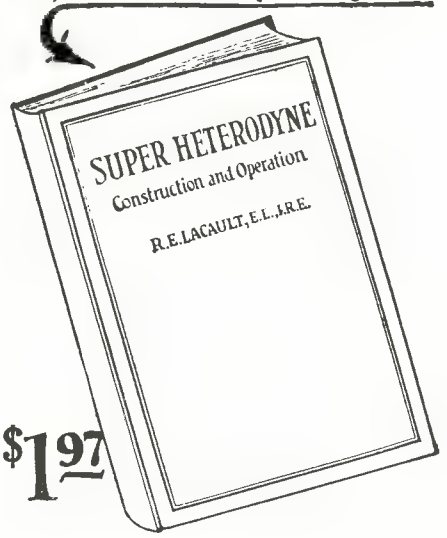
So now we have a total of $21,000.00 offered for proofs of Psychical Manifestations. Spiritualists—get busy.

R.E.Lacault* Knows-

SUPER-HETERODYNES

***Originator and designer of the nationally known 'ULTRADYNE,' Radio Engineer, and former Editor with many years practical experience on Super-Heterodynes.**

He has written this book for you



$1.97

R. E. LACAULT has been an Editor of Radio magazines for many years. He has specialized in the greatest and most powerful of all Radio Circuits, "The Super-Heterodyne." He has studied, originated and developed to marvelous perfection the "ULTRADYNE" Super-Heterodyne. He has advised thousands of set owners and builders in Super-Heterodyne problems.

—and now he has used his immense experience, his clear mind and his editorial ability to write, by far the most lucid, interesting, instructive and plainly written book on the theory and construction of Super-Heterodynes that has ever been published.

You who already own Super-Heterodynes will find this book especially helpful in locating and correcting troubles. A special trouble chart is printed for detecting and correcting common faults.

SEND NO MONEY

Just send us a card mentioning the book with your name and address. We will mail you the book. You pay the postman $1.97 plus a few cents postage on delivery.

Distributed by

THE CONSRAD CO., Inc.

230 Fifth Ave., New York, N. Y.

www.americanradiohistory.com

Were they maddened by fear, driven by despair, determined to slay before they themselves were slain? I do not know. But a group of those who had poured from the tunnel mouth were charging. They clustered close, their shields held before them. They had no bows. They moved down upon us in silence—swords and pikes gleaming.

The Smiting Thing saw them—at that moment I knew definitely, without shadow of doubt, that the deep shining points were eyes; could be nothing else.

Almost with the speed of light its tripod rocked it toward us; the gigantic metal tentacle straining out, flying to cut between its weird mistress and those who menaced us.

I heard Chiu-Ming scream, saw him throw up his hands, cover his eyes and run straight toward the pikes.

"Chiu-Ming!" I shouted, from a dry throat. "Chiu-Ming! This way!"

I ran toward him. Before I had gone five paces, a spear struck the Chinese squarely in the breast.

As he dropped, the giant flail swept down upon the soldiers. It swept through them like a scythe through ripe grain. It threw them, broken and torn, far toward the valley's sloping sides. It left only fragments that bore no semblance to men.

Ventnor was at Chiu-Ming's head; I dropped beside him. There was a crimson froth upon his lips.

"I thought that Shin-je was about to slay us." he whispered. "Fear blinded me."

His head dropped; his body quivered, and lay still.

We arose, and looked about us dazedly. At the side of the crevice stood the woman, her gaze resting upon Ruth in the arms of Drake, her head hidden on his breast.

The valley was empty—save for the huddled red heaps that dotted it.

On the mountain path a score of little figures crept, all that were left of those who had streamed down it.

High up in the darkening heavens the *lammergeiers,* the winged scavengers of the Himalayas, were gathering.

Of the Smiting Thing there was no trace!

The woman lifted her hand, beckoned us once more. Slowly we walked toward her, stood before her. The great clear eyes searched us.

CHAPTER VII

NORHALA

AT first all I could note were here glorious, limpidly lustrous eyes, gentle now as rain-washed April skies. Their gray irises were flecked with

IMPORTANT

TO NEWSSTAND READERS

IN order to eliminate all waste and unsold copies it has become necessary to supply newsstand dealers only with the actual number of copies for which they have orders. This makes it advisable to place an order with your newsdealer, asking him to reserve a copy for you every month. Otherwise he will not be able to supply your copy. For your convenience, we are appending herewith a blank which we ask you to be good enough to fill in and hand to your newsdealer. He will then be in a position to supply copies to you regularly every month. If you are interested in receiving your copy every month, do not fail to sign this blank. It costs you nothing to do so.

.....

To ..... Newsdealer

Address .....

Please reserve for me.....copies of SCIENCE & INVENTION every month until I notify you otherwise, and greatly oblige,

Name .....

Address .....

THEN CHOOSE AVIATION!

ARE you a red-blooded, daring he-man? Are you eager for a life of constant thrills, constant excitement and fascinating events? Do you crave adventure, popularity, admiration, and the applause of great crowds? Then why not get into the Aviation Industry—the greatest adventure since time began —.the greatest thrill ever offered to man?

Think what Aviation offers you. Thrills such as you never had before! The praise and plaudits of the multitude. And a chance to get in on the ground floor where rewards will be unlimited!

Aviation is growing so swiftly that one can hardly keep track of all the astonishing new developments. Air-mail routes have just been extended to form a vast aerial network over the entire U. S. Airlines and airplane factories are springing up all over the country. Men like Henry Ford are investing millions in the future of commercial Aeronautics in America! The possibilities are so tremendous that they stagger imagination.

Everything is set for the greatest boom in history. The fortunes that came out of the automobile industry and out of motion pictures will be nothing compared to the fortunes that will come out of Aviation! There is just one thing holding it up:—lack of trained men! Even in the beginning thousands will be needed—and generously paid. The opportunities open to them cannot be over-estimated. Those who qualify quickly will find themselves on the road to undreamed of money — success — popularity — and prominence!

PICK YOUR JOB!

Airplane Instructor
Airplane Engineer
Airplane Repairman
Airplane Assembler
Airplane Mechanician
Airplane Inspector
Airplane Builder
Airplane Salesman
Exhibition Manager
Airplane Contractor
Airplane Motor Expert
Airplane Designer

Easy to Become An Aviation Expert

Get into this thrilling profession at once while the field is new and uncrowded. Now — by a unique new plan—you can quickly secure the basic training for one of these wonderful high-salaried jobs, at home, in spare time. Experts will teach you the secrets—give you all the inside facts that are essential to your success. And, the study of Aviation is almost as fascinating as the actual work itself. Every Lesson is chockful of interest—and so absorbing that you actually forget you are studying. Best of all are the ultimate rewards you are fitting yourself to gain!

Send for FREE Book

Send the coupon for our new, free book, just out—*Opportunities in the Airplane Industry.* It is vitally interesting, reads like a romance and tells you things about this astonishing profession you never even dreamed of. This book is so fascinating it could easily sell for a dollar. We offer a limited number FREE. Write for yours today.

American School of Aviation
Dept. 1428, 3601 Michigan Ave.
Chicago, Ill.

AMERICAN SCHOOL OF AVIATION,
Dept. 1428, 3601 Michigan Ave., Chicago, Ill.

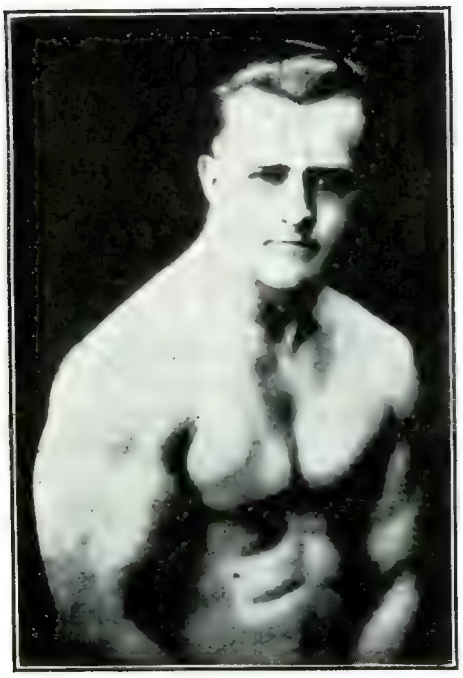
Without any obligation please send me FREE book *Opportunities in the Airplane Industry.* Also information about your course in practical Aeronautics.

Name..... Age.....

Address .....

City..... State.....

www.americanradiohistory.com



EARLE E. LIEDERMAN
The Muscle Builder
Author of "Muscle Building," "Science of Wrestling," "Secrets of Strength," "Here's Health," "Endurance," etc.

If You Were Dying To-Night

and I offered something that would give you ten years more to live, would you take it? You'd grab it. Well, fellows, I've got it, but don't wait till you're dying or it won't do you a bit of good. It will then be too late. Right now is the time. To-morrow or any day, some disease will get you and if you have not equipped yourself to fight it off, you're gone. I don't claim to cure disease. I am not a medical doctor, but I'll put you in such condition that the doctor will starve to death waiting for you to take sick. Can you imagine a mosquito trying to bite a brick wall? A fine chance.

A RE-BUILT MAN

I like to get the weak ones. I delight in getting hold of a man who has been turned down as hopeless by others. It's easy enough to finish a task that's more than half done. But give me the weak, sickly chap and watch him grow stronger. That's what I like. It's fun to me because I know I can do it and I like to give the other fellow the laugh. I don't just give you a veneer of muscle that looks good to others. I work on you both inside and out. I not only put big, massive arms and legs on you, but I build up those inner muscles that surround your vital organs. The kind that give you real pep and energy—the kind that fire you with ambition and the courage to tackle anything set before you.

ALL I ASK IS NINETY DAYS

Who says it takes years to get in shape? Show me the man who makes any such claims and I'll make him eat his words. I'll put one full inch on your arm in just 30 days. Yes, and two full inches on your chest in the same length of time. Meanwhile, I'm putting life and pep into your old back-bone. And from then on, just watch 'em grow. At the end of thirty days you won't know yourself. Your whole body will take on an entirely different appearance. But you've only started. Now comes the real works. I've only built my foundation. I want just 60 days more (90 in all) and you'll make those friends of yours who think they're strong look like something the cat dragged in.

A REAL MAN

When I'm through with you you're a real man. The kind that can prove it. You will be able to do things you had thought impossible. And the beauty of it is you keep on going. Your deep full chest breathes in rich, pure air, stimulating your blood and making you just bubble over with vim and vitality. Your huge square shoulders and your massive muscular arms have that craving for the exercise of a regular he man. You have the flash to your eye and the pep to your step that will make you admired and sought after in both the business and social world.

This is no idle prattle, fellows. If you doubt me, make me prove it. Go ahead, I like it. I have already done this for thousands of others and my records are unchallenged. What I have done for them, I will do for you. Come then, for time flies and every day counts. Let this very day be the beginning of new life to you.

Send for My New 64-Page Book

"MUSCULAR DEVELOPMENT"

It contains forty-eight full-page photographs of myself and some of the many prize-winning pupils I have trained. Some of these came to me as pitiful weaklings, imploring me to help them. Look them over now and you will marvel at their present physiques. This book will prove an impetus and a real inspiration to you. It will thrill you through and through. This will not obligate you at all, but for the sake of your future health and happiness do not put it off. Send to-day—right now before you turn this page.

EARLE E. LIEDERMAN
Dept. 2711 305 Broadway, N. Y.

EARLE E. LIEDERMAN
Dept 2711, 305 Broadway, New York City
Dear Sir: Please send me, without any obligation on my part whatever, a copy of your latest book, "Muscular Development." (Please write or print plainly.)

Name .....
Address .....
City ..... State .....

golden amber and sapphire-flecks that shone like clusters of little aureate and azure stars. Then, with a thrill of wonder, I saw that these tiny constellations were not in the irises alone; that they were clustered within the pupils, deep within them, like stars in the depths of velvety, midnight heavens.

Whence had come those cold fires that had flared from them, I wondered—more menacing, far more menacing, in their cold tranquility, than the hot flames of wrath? These eyes were not perilous—no. They were calm and still, and in them a shadow of interest flickered, a ghost of friendliness smiled.

Above them were level, delicately penciled brows of bronze. The lips were coral crimson and—asleep. Sweeter were those lips than any master painter, dreaming his dream of the soul of woman's sweetness, ever saw in vision, and limned upon his canvas—and asleep, nor wistful for awakening. A short straight nose, a broad low brow, and over in the masses of her hair—tawny, lustrous topaz, cloudy, metallic.

MODEL DEPARTMENT BLUEPRINTS

Correct—Easy to Follow

1–2	Horizontal Steam Engine details.....set	$1.00
3–4	Boiler construction for above .....set	$1.00
5	880 Ton Bark.....	50c
6–7	Twin Cylinder Steam Engine and Boiler set	$1.00
8–9	Gasoline Fired Locomotive .....set	$2.00
10–11	U. S. S. Constitution, "Old Ironsides" ....set	$1.00
12	13th Century Man-of-War	50c
13–14	Chinese Junk .....set	50c
15–16	Electrically driven Automobile .....set	$1.00
17–18	How to Build a Reflecting Telescope	$1.00
19	Roman Ballista	50c
20–21	Simple Steam Engine, set	50c
22	"Santa Maria," complete	50c
23–24	Model U. S. S. Portsmouth .....set	$1.00
25	Building a Model Tugboat	50c

Send Orders to

MODEL DEPARTMENT
SCIENCE AND INVENTION

230 Fifth Avenue
New York City

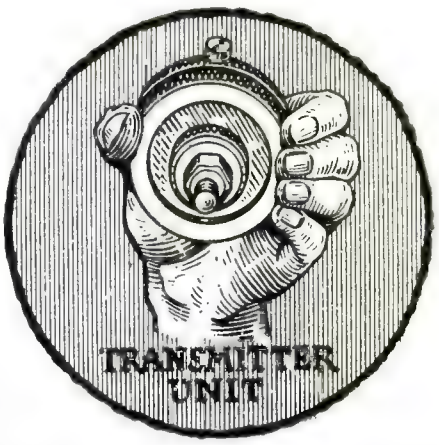
Down from the wondrous face melted the rounded column of her throat, to merge into exquisite curves of shoulders and breasts, half revealed beneath the swathing veils.

Upon her face, within her eyes, shadowing her red lips and clothing her breasts, was something unhuman. Something that came straight out of the still mysteries of the star-filled spaces; out of the ordered, the untroubled, the illimitable void. A passionless spirit that watched over the human passion in the scarlet mouth and in every slumbering, exquisite line of her—guarding her against its awakening. She was Ishtar, dreamless within Nirvana.

Something was in her that was not of this world we know—and yet of it as the winds of the Cosmos are in the summer breeze, the ocean in the wave, the lightnings in the glow-worm.

Her skin was white as the milk of pearls; gossamer fine, silken and creamy; translu-

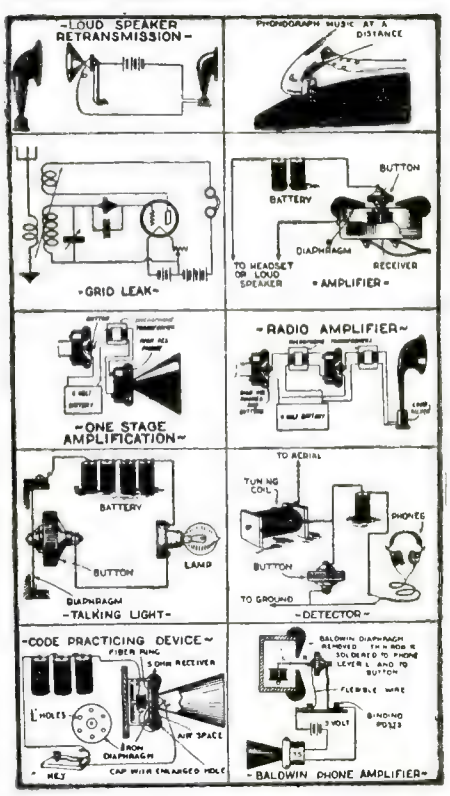
Thousands Use These Ingenious TRANSMITTER UNITS



Here's a marvel of engineering design—a practical miniature transmitter, used by thousands of radio fans and experimenters for amplification purposes.

It is a most novel unit, having hundreds of uses. Every amateur should have two or three of these amplifiers in his laboratory.

A FEW USES FOR THESE UNITS



With each unit is mailed an eight-page instruction pamphlet containing suggestions for innumerable uses.

Our supply is limited; avoid disappointment by ordering today. The coupon below is for your special convenience.

SPECIALLY PRICED AT . . . **95c**
(or Two for $1.75) per unit

THE PRESS GUILD,
16-S East 30th St., New York, N. Y.
Enclosed find 95c/$1.75 for which send me postpaid one/two amplifier units as advertised.
Name .....
Address .....
City, State .....

www.americanradiohistory.com

cent as though a soft brilliancy dealt within it. Beside it Ruth's fair skin was as some roughened country lass's to Titania's.

She looked at us as though she were seeing for the first time beings of her own kind. She spoke, and her voice was chimingly sweet like hidden little golden bells; filled with that tranquil, far-off spirit that was part of her—as though indeed a tiny golden chime should ring out from the silences, speak for them, find tongue for them. The words were hesitating, halting, as though the lips that uttered them found speech strange—as strange as the eyes found our images.

The words were Persian—purest, most ancient Persian.

"I am Norhala," the golden voice chimed forth, and whispered down into silence. "I am—Norhala."

She shook her head, half impatiently. A hand stole forth from beneath her veils, slender, long-fingered. The hand touched Ruth's head, drew it gently from Drake's clasp, turned it until the strange, flecked orbs looked directly into the misty ones of blue. Long they gazed—and deep. Then Norhala thrust out a finger, touched a tear that hung upon Ruth's curled lashes, and regarded it wonderingly. Something of recognition, of memory, seemed to awaken within her.

"You are—troubled?" she asked, still with that halting effort.

Ruth shook her head.

"They—do not trouble you?"

Exposés

***of* Scientific Swindles**

appear often in

SCIENCE AND INVENTION

If you know of some hokus-pocus scheme being used to swindle the public—write the Editor about it.

She pointed to the huddled heaps strewing the hollow. And then I saw whence that light which had streamed from her great eyes came; for the little azure and golden stars paled, trembled, then flashed out like galaxies of tiny, clustered silver suns.

From that weird radiance Ruth shrank, affrighted.

"No—no," she gasped. "I weep for—him." She pointed where Chiu-Ming lay, a brown blotch at the edge of the shattered men.

"For—him?" There was puzzlement in the faint voice. "For—that? But why?"

She looked at Chiu-Ming. There was a faint wonder on her face when at last she turned back to us. Long she considered us.

"Now," she broke the silence, "now something stirs within me that it seems has long been sleeping. It bids me take you with me. Come."

She turned from us, and walked to the crevice.

"Chiu-Ming." Drake spoke. "We can't leave him like that. At least, let's cover him from the vultures."

"Come!" Norhala had reached the mouth of the fissure.

"I'm afraid! Oh, Martin—I'm afraid," whispered Ruth.

'Come!" commanded the woman.

Ventnor shrugged his shoulders.

"Come, then," he said.

With one last look at the Chinese, the *lammergeiers* already circling about him, we walked to the crevice. The woman waited, silent, until we had passed her; then glided behind us.

Before we had gone ten paces, I realized that the place was no fissure. It was a tunnel, a passage hewn by human hands, its walls

SPANISH SHIP MODEL
See LePage's Book, page 4

SMOKING CABINET
See LePage's Book, page 13

PRISCILLA SEWING BOX
See LePage's Book, page 11

This NEW Book

will show you how to make 20 attractive pieces of furniture

NEVER before has a book been offered that contains so much practical work shop help at so low a price. It contains complete information for making 20 different pieces of gift furniture, designed by an expert—attractive, artistic, useful, practical, and easy to make. Any one of them is ideally suited to be a prized and handsome Christmas gift.

New Book—greatly improved

THE first LePage's Home Work Shop Book, published a year ago, proved so popular that, though advertised only a few times, over 30,000 copies were sold—an enormous edition for a book of this kind. Now the new book, just off the press, represents a wonderful improvement over the old one. Of its 20 complete projects, 16 are entirely new and never offered before.

Each project is presented in three parts—a photographic illustration of the finished project, a complete dimension drawing of its parts, and simple, easy-to-folllow directions, for making, given step by step from start to finish.

Designed by expert

FOR each of the 20 gift furniture projects, the design, dimension drawings and photographs, as well as the actual articles, were made by William W. Klenke, Instructor in Woodworking, Central Commercial and Manual Training High School, Newark, New Jersey. Assurance is therefore given that each project and the directions for making it are perfectly practical.

In addition to the three pieces illustrated above, the book includes the following 17 projects: Occasional Table, Folding Sewing Screen, Fernery Stand, Tilt Top Table, Piano Bench, Costumer, Cedar Chest, Table Desk, Desk Chair, Card or Console Table, Book Stand, Turned Bench, Dressing Glass, End Table with Book Trough, Foot Stool, Back Rest, and Hanging Book Shelves. Where else could you get complete directions for making all these things for only 10 cents?

In addition, this new LePage's book contains full information on how to secure plans for making eighteen more new projects, prepared by Frank I. Solar, Teacher of Manual Training in Detroit Public Schools, and widely-known tool craft writer.

Handiest Tool in your Work Shop

Send 10 cents for this NEW LePage's Home Work Shop Book

JUST write your name and address on the coupon below, tear it out and mail to us to-day with 10 cents in coin or stamps, and we will at once send you a copy of LePage's New Home Work Shop Book, postage paid. Address LePage's Craft League, 569 Essex Ave., Gloucester, Mass. Tear out the coupon now so you won't forget it.

LE PAGE'S GLUE

Bottles, Tubes, Cans

MAIL THIS COUPON

LEPAGE'S CRAFT LEAGUE,
569 Essex Ave., Gloucester, Mass.

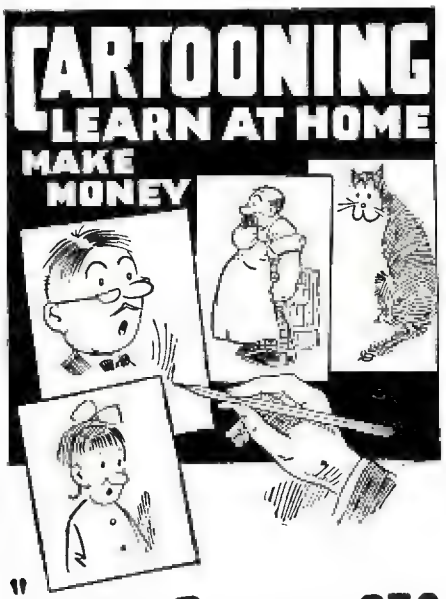
Gentlemen: Enclosed please find 10 cents (coin or stamps) in payment for LePage's New Home Work Shop Book. Please send a copy of this book to:

Name .....

Street .....

City .....*State*.....

www.americanradiohistory.com



"Student Receives $250 For a Few Cartoons"

Just read the following "straight from the shoulder" letter and you'll see why we say that the Washington School of Cartooning can prepare you for the big-pay field of Cartooning, in your spare time, at home, by mail.

"The enclosed cartoons," says O. A. Pokrandt, a Wisconsin student, "are samples of my progress in drawing. I have received $250 for these and the enclosed letter will show that I have a ready market for my work in the future. The making of cartoons has been one round of pleasure and enjoyment as well as profitable to me."

Cartooning Pays Big

There's no more attractive or highly paid profession today than Cartooning. Millions of dollars are spent every year on cartoons. Capable cartoonists earn from $50 to $250 a week. Learn to draw side-splitting comics—right at home in spare time through this amazing method that has already been tested and proved by many Washington School Graduates. No special talent or previous training needed. No drudgery. And in a very short time you should be ready to make real money drawing cartoons.

Send for FREE Book

A new handsomely illustrated book has just been printed, which gives all the most up-to-date information on the wonderful opportunities in Cartooning, and shows how this startling method enables you to enter this field. It tells all about our students—their success—what they say—actual reproductions of their work—how they made quick profits while studying. This attractive book will be sent without cost or obligation. Send for it. Mail coupon NOW. (No salesman will call.) WASHINGTON SCHOOL OF CARTOONING, Room 2611-E, 1113-15th St., N. W., Washington, D. C.

Washington School of Cartooning,
Room 2611-E, 1113-15th St., N. W.
Washington, D. C.

Please send me, without obligation, your illustrated FREE BOOKLET on Cartooning and details of Special Offer to New Students.

Name .....
(Write name plainly—state whether Mr., Miss or Mrs.)

Address .....

City..... State.....

Age.....

covered with the writhing dragon lines, its roof the mountain. As I peered into its depths, the woman swept by us, taking the lead. Far ahead, was a wan gleaming. It quivered, a faintly shimmering, ghostly curtain, half a mile away. Now it was close. We passed through it, and out of the tunnel. Before us stretched a narrow gorge, a sword slash in the body of the towering giant under whose feet the tunnel crept. High above was the ribbon of sky.

The sides were dark, but it came to me that here were no trees, no verdure of any kind. Its floor was strewn with boulders, fantastically shaped, almost indistinguishable in the fast closing dark. Twin monoliths bulwarked the passage end, leaning and crumbling. Fissures radiated from the opening, like deep wrinkles in the rock, showing where earth warping, range pressure, had long been working to close this hewn way.

"Stop!" Norhala's abrupt, golden note halted us.

"It may be well——" she spoke as to herself. "It may be well to close this way. It will not be needed when——"

She ceased speaking and began a low chanting. It was murmurous, yet with sharply accented rhythms. In it were tones and progressions utterly unfamiliar to me, raising in my mind strange images of darting lines, spinning spirals, interlacing arcs of light. And it was as ordered, that song—if song it could be called—as mathematical, as geometric, as had been the gestures of the Lilliputians of the ruins, the Brobdingnagians of the hollow. It was like those gestures transformed into sound.

WANTED

Copies July, 1926, SCIENCE and INVENTION. Write I. S. Manheimer, c/o S. & I., 230 Fifth Avenue, New York City.

There was movement in the darkness down by the mouth of the tunnel. Glimmerings that came and went like winking eyes of many colored flame; flashes as of giant fireflies.

Then came bolt after bolt of vividly green lightning. The cliff face broke loose and avalanched down.

When I re-opened my dazzled eyes the lightnings had ceased. At the end of the canyon lingered a faint phosphorescence. By it, I saw that the tunnel's mouth had been sealed by tons of shattered rock. There was a rushing sound all about us as though great bodies were racing past. Something grazed my hand, something whose touch was like warm metal. The rushing passed, and whispered into silence.

"Come!" Norhala flitted ahead of us. I found Ruth beside me; felt her hand grip my wrist.

"Louis," she whispered, "Louis—she isn't human!"

"Nonsense," I muttered. "Nonsense, Ruth. What do you think she is—a goddess, a spirit of the Himalayas? She's as human as you or I."

"No," she said. "Not all human. There's something else in her—something stronger than humanness, something that—makes what is human in her sleep," she added, astonishingly voicing my own thought.

I could find no answer for her. Silently, we followed the woman. At last the high ribbon of sky vanished; it seemed to be overcast, for I could see no stars. Norhala halted. Out of the blackness before us came a succession of curious, muffled clickings, like a smothered *mitrailleuse*.

The nation's strength is the nation's health

Buy Christmas Seals and help preserve it

THE NATIONAL, STATE, AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES

RADIO AGENTS Make Big Money

EASY to sell American Radios and Supplies. Nationally advertised, high quality merchandise at wholesale. Big profit on every sale. No capital to invest. No stock to carry. Order direct from my huge warehouse as you sell

Get My Liberal Offer and also Big New 132-page Catalog and Guide—"How to Sell Radios"—Free. Full of Bargains—all latest in Radio. Write today.

AMERICAN AUTO & RADIO MFG. CO.
BARRY SCHWARTZBERG, PRES.
Dept. 276 American Radio Bldg., Kansas City, Mo.

FREE BIG BARGAIN CATALOG

WADE BENCH LATHE

Cap: 4" dia. x 12" length. Sliderest has travel entire length of bed. Lead-screw inside bed. Hollow spindle. Turning, facing, boring, drilling, winding, thread-cutting. No. 1 Lathe, plain headstock $28.00. No. 2 Lathe back-geared headstock $58.00. Either lathe, 4"x18" $7.00 extra. Complete line of accessories. Catalog sent free.

The Gerold Co., Dept. S-26, 120 Liberty St., New York

www.americanradiohistory.com

"Cross," Norhala pointed into the blackness ahead of us; then, as we started forward, she thrust out a hand to Ruth and held her back.

We saw a shaft of pale-blue phosphorescence piercing the murk. It was an unbroken span of the huge cubes, running over an abyss that gaped at my very feet. All of a hundred feet they stretched; a slender lustrous girder crossing unguessed depths of gloom. From far below came the faint whisper of rushing waters.

I faltered. For these were the blocks that had formed the body of the monster of the hollow, and its flailing arms. The thing that had played so murderously with the armored men.

"Do not fear." It was Norhala speaking, softly, as one would reassure a child. "Cross!"

I stepped out. The span stretched, sharp edged, and smooth, only a slender, brighter line revealing where each great cube held fast to the other. I walked at first slowly, then with ever-increasing confidence, for up from the surface streamed a force that was like a host of invisible hands, steadying me, keeping firm my feet. I looked down; the myriads of enigmatic eyes were staring, staring up at me from deep within the blocks. From the depths came more clearly the sound of the waters. Now there were but a few feet more of the bridge before me; and now I had reached its end.

Over the span came Ventnor, leading his laden pony. He had bandaged its eyes so that it could not look upon the narrow way it was treading. And close behind him, a hand resting reassuringly upon its flank, strode Drake, swinging along carelessly. The little beast ambled along, surefooted as all its mountain kind, and docile both to darkness and guidance.

Then, an arm about Ruth, floated Norhala. She was beside us. She dropped her arm from Ruth.

"Come!" summoned Norhala, and took once more the lead. Soon, looking up, I caught the twinkle of a star, and knew the cleft was widening. The stars grew thicker. We stepped out into a valley ringed, like that from which we had fled, with sky-touching summits. Here we could see more clearly. Close by was a small hillock, and to the top of this she led us.

Her veils had slipped, baring her neck, her arms, a shoulder. A buckle of dull gold held the folds of amber silk that swathed the high and rounded breasts. A wide girdle of gold covered waist and hips. Upon her feet were golden sandals laced above the slim ankles with turquoise studded bands of gold.

"Now being with you," she said in those halting accents, "being with you, there waken within me old thoughts, old questionings—things that I had forgotten, and thought forgotten forever——"

A brilliant ray of greenish light stabbed up from behind the mountains at the north, touched the zenith and drew back. A flicker pulsed over the sky, and another and another. Up marched the lances and streamers of the aurora. Only a moment were our eyes turned from the woman—yet when we looked again she was gone.

The hosts of slender shining spears of green and the waving banners of ghostly blues and reds grew thicker and more brilliant. Ventnor gripped my wrists, and spun

Radio Wrinkles Wanted!

The Radio Editor, Mr. Paul E. Welker, wants to hear from you, if you have a good idea or wrinkle. Make a pencil or pen and ink sketch of the contrivance, write 50 words or so of description, and mail to the Radio Editor, c/o this magazine.

The Man Who is Astounding America!

What is the mysterious power wielded by this man — a power he also shows others how to use? What is this new method which has started thousands of despairing persons on the road to health, happiness and prosperity?

THOUSANDS upon thousands have been turned away from the great theaters and auditoriums in Chicago, New York, San Francisco, Seattle, Denver, Boston, and practically every great city in America where Dr. Bush has been lecturing! These vast halls could not accommodate half of those who heard of his wonderful powers and had heard how he disclosed the secret of his powers to others!

Those who were ill had been shown how to become well and strong by a method to which other mental science movements were as the first step in a mammoth, far-reaching stairway.

The worried and the nervous had been shown how to rise above their mental and nervous troubles in a single evening and how to attack and solve their problems with a keener mind unhampered by despair.

An Astounding New Power

But that wasn't all. As wonderful as it is to have the secret of mental and physical health in one's grasp—there is a still greater force at work in the universe. This force can be harnessed in such a way as to bring us the MATERIAL things we want—money, power, influence, no matter what it is. And Dr. Bush has harnessed this force; has proved its value in his own case; and has proved time and again that he can show others how to use this power.

Long before the lectures were over the reports began to come in showing how quickly his audiences had been taught to use this wonderful power.

"By your method of visualization I secured the funds to build my home," writes one of Dr. Bush's Chicago listeners. Mrs. Mary Roberts of Denver writes, "My salary was increased 40% in one week by following your psychological method—and my powers of salesmanship were DOUBLED." "TEN Thousand Dollars would not pay for the benefits I have received," James C. Smith of Somerville, Mass., writes him. Another says, "I was making no money, my health was bad and I was heavily in debt. Now I have a store of my own and am doing a good business. My family and myself enjoy the best of health." A man who learned of this power in Pittsburgh — he had never earned more than $25 per week — stepped out the first month and made over $1,000. Dr. Bush has thousands of letters like these. They are his proudest possessions.

Partial List of Contents

Psycho-Analysis and the Subconscious
How to Have Amazing Memory
How to Destroy Fear—Man's Worst Enemy—the Unseen World
What is Love and How to Keep It
How to Be Popular
How to Overcome Failure and Adverse Environment
How to Be Beautiful Through Mysterious Force
Vibration—How to Win Success—How to Develop Personality
How to Conquer Illness
Poverty a Disease—How to Overcome It
How to Double Your Efficiency
Visualization—How to Make Your Dreams Come True
The Mastery of Fate
How to Use Suggestion for Health, Success and Happiness
The Greatest Law in the Universe, Just Lately Discovered, and How to Use It
What the World Owes You and How to Get It
After This Life What?—What Is God?
Smile, Smile, Smile
Psychology of Health—Building the Body Beautiful
Long Life and Full of Pep.

His Teachings Now in Book Form

DAVID V. BUSH
America's Foremost Author-Lecturer on Practical Psychology.

Dr. Bush's sole idea in giving these lectures is the same idea that actuated him in his earlier days before he had discovered this amazing new force. Then as an earnest and brilliant young minister of the Gospel he had refused honors and financial returns, in order to apply his efforts where they would do good to the greatest number. His lectures are given for the same reason—to teach this new force to everyone who will learn. And to reach still more people he has incorporated his lectures in an absorbingly interesting book, "Applied Psychology and Scientific Living," which will be sent, on FREE TRIAL, to any earnest seeker after knowledge. Luther Burbank said, "Applied Psychology appears to me the most practical and useful work which has been published on these and similar subjects."

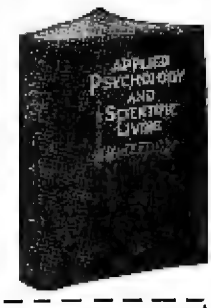
When You Need This Book

Are you nervous or depressed? Do you feel old? Have you lost your grip? Have you a worrying disposition? Have you a personality that fails to attract others? Are you timid? Are you misunderstood? Do others seem inclined to give you always the worst of everything? Do you lack the aggressiveness necessary to bring you position and power? Are you in ill health? Have you any chronic disease? Is anyone in your family or among your friends so affected? Are your children wilful and disobedient?

Examine It Free!

But no description can begin to give you even an idea of the startling truths explained and proved in this wonderful 540-page book. The very first page will be a revelation to you just as Dr. Bush's lectures have been a revelation to keen, thinking, analytical minds in every city. One enthusiast says, "It can be understood by everyone. And if everyone would read it and then use this new force, humanity would advance 5,000 years overnight."

But you will be the sole judge of this wonderfull value. Mail the coupon. This remarkable book will be sent at once. Read it for 5 days. Practice this new force yourself. At the end of that time if you find it the most inspiring, the most valuable means to obtain health, wealth and happiness send us only $3.50 which, as you will realize, pays only for the cost of printing, advertising and distributing the 540-page book. Otherwise return the book itself within 5 days and you will not owe a penny. But begin to enjoy the benefit of this new force at once. Mail the coupon today.



DAVID V. BUSH, Publisher, Dept. 10911, 225 N. Michigan Ave., Chicago, Ill.

DAVID V. BUSH, Publisher, Dept. 10911
225 N. Michigan Ave., Chicago, Ill.

Please send me a copy of "Applied Psychology and Scientific Living" for approval. I agree to remit $3.50 or remail the book in five days.

Name .....

Address .....

City ..... State.....

(Remittance from Foreign countries and U. S. possessions must accompany all orders.)

www.americanradiohistory.com

The First Evening with his *Buescher*

-and Three Weeks Later *Going Strong!*

IT'S just a step from the wall-flower's corner to the center of popularity ring. Don't let the other fellows capture all the good times, and the smiles of those whose smiles are worth while. Be the whole show with your

BUESCHER

True Tone Saxophone

This is the one instrument that you know you can learn to play. If you can whistle a tune you can't fail with a Buescher saxophone. You can learn to play quickly, with comparatively little effort.

Join the Home Town Band

With the aid of the 3 lessons given on request with each new Buescher, many learn scales first hour and play tunes first week. You can teach yourself, and in 90 days join the Band, or play with an orchestra, at good pay.

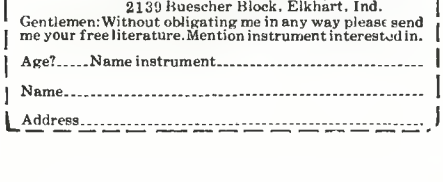
Only Buescher Assures Success

But only with a Buescher is this rapid progress assured. You don't have to fuss and favor for certain notes. Just open the key and blow normally. Every tone full, clear and true.

Six Days' Trial. Easy Terms

Take any Buescher Instrument home for 6 days' trial. If you like it, pay a little each month. Send coupon for beautiful catalog and details of this liberal plan. There will never be a better time to start. Write today.

BUESCHER BAND INSTRUMENT CO.
Everything in Band and Orchestra Instruments
2139 Buescher Block Elkhart, Indiana



Buescher easy playing Trumpets and Trombones are the choice of the world's leading artists. Mail coupon for special catalog of your favorite instrument.

BUESCHER BAND INSTRUMENT CO., 341D
2139 Buescher Block, Elkhart, Ind.
Gentlemen: Without obligating me in any way please send me your free literature. Mention instrument interested in.

Age?.....Name instrument.....

Name.....

Address.....

me toward the right. A thousand feet away was a spur of bare black rock rising perhaps fifty feet above the valley floor. Norhala stood upon its crest.

She had cast her veils from her. Her naked arms were lifted to the sparkling skies, and all her bared body was outlined in living light. Light filled her, light streamed from her as though she were a crystal vase fashioned in woman's form. She was singing; we heard like faint chimes on golden bells the echoes of her song.

Around her, half circling the black spur, shone myriads of gem fires, flares and flames of pale emerald, glowing of flame rubies, sapphire lambencies, flashing opalescences, irised glitterings. A moment they gleamed. Then from them came bolt upon bolt of lightning—lightning that darted upon the exquisite body swaying there, and broke and sprayed, cascading like water from her.

The lightnings bathed her—she bathed in them!

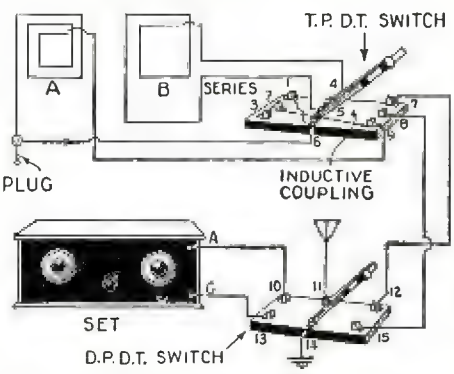
The skies filled with a swift mist. The aurora was veiled. Darkness dropped like a curtain between us and the black spur.

(To be continued in next issue)
(Second Serial Rights)

Making A Loop-Speaker

By HERBERT C. McKAY

(Continued from page 624)



The above diagram shows the method in which the loop is connected to the set through a triple pole double-throw and double pole double-throw switch.

After the loop-speaker has been finished, it should be connected to the set in accordance with the diagram shown here. A is the large loop and B the small one. One side of A is permanently connected to the loop plug, or to a loop terminal within the set. In the triple pole double-throw switch, poles 4, 5 and 6 and the blade connections connect with 1, 2 and 3 on one throw and with 7, 8 and 9 on the other throw. The two terminals of loop B are connected to poles 4 and 5 while the switch plug has its free connection secured to pole 6. Note that pole 6 is also connected to pole 1. Now when the throw to the left is made for a series connection, we find that from the plug the current path is through A to 9 to 2 to 5 through loop B to 4 to 6 to plug, completing the circuit. The aerial and ground leads are connected in the conventional manner to a D.P.D.T. switch for changing connections to loop or direct to set. Disregarding this switch, assuming it is set for the loop system, the current path, when the loop switch is thrown to the right, is aerial to 7 to 4 through loop B to 8 to ground, by inductance from loop B to loop A. The A circuit is then from plug through loop A to 9 to 6 to plug. This gives us two complete circuits in inductive relation.

THE WORLD'S GREATEST TELESCOPE
Read all about it in the December issue.

250 POWER MICROSCOPE
MADE IN U.S.A.

Educational and entertaining, this fine instrument familiarizes young and old with life around us that is invisible to the unaided eye. Tiny insects appear as monsters. Plant and mineral life reveal new beauties in form and color. Ideal for students, home, office, dentists, physicians, scientists and laboratory. Precise optical qualities, giving variable magnification from 100 to 250 diameters. Tilting stand. Black finish, nickel trim. Complete with plush lined case, prepared slide and instructions. 100 Power Model $8.50. At your dealer or direct, postpaid. Money back guarantee.

Further information free upon request.

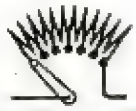
$16.50

Models as low as $2.50

Wollensak Optical Company
966 Hudson Avenue : : Rochester, N. Y.

Electrical Engineering

Course for men of ambition and limited time. Over 5000 men trained. Condensed course in Theoretical and Practical Electrical Engineering including the closely related subjects of Mathematics and Mechanical Drawing. Students construct motors, install wiring, test electrical machinery. Course designed to be completed in *one college year.*



BLISS ELECTRICAL SCHOOL
Prepare for your profession in the most interesting city in the world. Catalog on request.
151 Takoma Ave., Washington, D.C.

MEN'S STRAP WATCH
DIRECT FROM SWITCHERLAND

$3.99

Radium Dial Jeweled Movement
Silveroid, Cushion Shaped Case

This fully guaranteed watch cannot be manufactured in America for less than $12. Genuine leather strap. Accurate--durable--handsome. SEND NO MONEY. Pay on delivery $3.99 plus postage. "FEDCO"
U. S. Swiss Agents, 561 Broadway, New York City, Dept. W17

SELF STARTING POCKET LIGHTER

WINNER FOR AGENTS

New pocket lighter: What makes it light? Why can't a blizzard blow it out? No flint—No friction—No troublesome parts. Why fool with matches now? Instant—infallible—guaranteed. Send 50c for sample and selling plans. Sample Gold and Silver Plated.....$1.00
NEW METHOD MFG. CO. Box S.I.-11. Bradford, Pa.

MAKE MORE MONEY CANDYMAKING AT HOME

BIG PROFITS being made by men and women with our WORLD'S SPECIALITY CANDIES new method no expensive equipment or machinery. System operated anywhere, kitchen, shop or factory. Simplified home study course. Learn today, earn tomorrow. We furnish supplies; few dollars start you. Write today for proof of students' success. Free booklet explains.

Liberty Candy & Supply Co. DEPT. G 355 So. BROADWAY LOS ANGELES, CALIFORNIA

$25

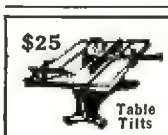


Table Tilts

Kennedy Utility Saw

Will rip, cross cut, sand, and grind. With extra attachments you can plane, groove, tongue, plough, miter, bevel, bore, rabbet, mortise, joint, make mouldings—extremely efficient for building radio cabinets, tables, etc.

Ball Bearing Pat. 1622237

RALPH M. KENNEDY
111 N. 7th St., Philadelphia, Pa.

Learn To Hypnotize!

Complete course of Hypnotism, Mind Reading and Magnetic Healing. 25 fascinating lessons. How to become an expert, hypnotize at a glance, make others obey your wishes, overcome bad habits and enemies, gain in power, wealth, love. Simple, easy system. Equals $20 course; now only $1. Send stamps, cash; no more to pay.
Educator Press, Fuller Bldg., Jersey City, N. J. Dept. 3711

www.americanradiohistory.com

Peyote—Mystic Fruit of Mexico

By COUNT A. N. MIRZAOFF

(*Continued from page* 605)

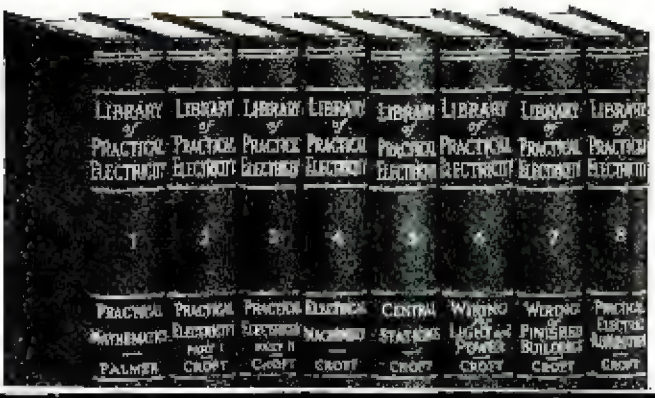
The peyote cult, as it now exists in many of the plains tribes, represents the union of three elements, i.e., the symbolism of peyote as found in Mexico, the adoption of the plains ritualistic complex, and the Christian interpretation. This later symbolism is generally practised among the Christianized Indians, whose prayers during ceremonial meetings are made to the Indians' spirits first, and then are redirected to the Christian God; then the Bible is added and the Bible reading is introduced. The plain Indians talk becomes sermons, and the abracadabra songs are afterward transformed into the Christian Hymns. The closing ceremonies consists in everybody partaking of a small quantity of the divine fruit.

According to the observation made by Prentiss and Morgan, Havelock Ellis and Rouhier, the "God of Peyote" favors those persons who are in the best of health, that is people who have maintained a healthy body will not suffer any bad effects after eating the plant; instead, they will enjoy the beautiful things of the spiritual world.

Prof. Rouhier, in his recent studies of the physiological effect produced by peyote, states that there are two well-defined periods of intoxication in evidence. In the first phase, the subject is in a high state of nervous excitement which occurs three or four hours after consumption. His senses are often interversed, especially those of audition, the latter is usually succeeded by autoscopy such as causing repetition of objects and seeing very vivid colors. Peyote, according to Rouhier, does not provoke that powerful state of exhilaration that hashish produces,—nor the burning sensation as produced by alcohol. Peyote augments first the physical as well as enriches the intellectual faculties of the user. In other words the pupil, that infallible barometer of cerebral activity, dilates and increases the sensibility of the eye to the light and increases acuteness of visual perception. The relief of objects as seen by the peyotite is intensified and their color is modified during a period of 24 hours, which is the maximum time for the duration of the complete state of intoxication.

At the peak of ecstasy, the peyotite, if placed in a dark room with his eyes shut, will feel an unusual luminous sensation as if coming from nowhere. Certain details may appear to him painted with extraordinary bright colors. Weir Mitchell, another investigator, wrote as follows: "I am completely in despair trying to describe this enchanting spectacle. It seems as though there is no tongue of flesh capable of even initiating an expression that will do justice to the beauty and splendor of the vision provoked by this divine plant."

Peyote has been condemned by the U. S. authorities and strict ban is placed over its importation. Peyote traffickers sell it in the form of a dried bean and it is known as *Mescal-buttons*. The restriction of peyote is hotly contested by M. Rouhier. He claims that peyote is not a habit-forming drug, and he recommends its use in therapeutics as a sedative tonic of great benefit and an active stimulant for the nervous system. He further advocates the use of peyote in the higher branches of medical science. For instance, he goes on; "Its effects upon the cerebral mechanism is of immense value to the psychoanalyst, psychologist and psychiatrist in the study of mental derangement among criminals. In other words by placing a murderer under the influence of this divine drug, it will be possible for the examiner to easily procure a confession."



These Famous ELECTRICAL BOOKS Make Promotion Sure!

"Know electricity as experts Know it and get an expert's pay"

THE Croft Books bring the big-pay job within your reach. They give you a complete electrical education—sound, thorough and practical. They teach you electricity as practiced by experts. They fit you for more responsible positions—they give you a short cut to success in the electrical field.

With these books, no problems in practical electricity should be too hard for you to solve—no job too big for you to tackle.

Easy Steps to Success in Electricity

No method of teaching electricity offers a quicker, surer way to success than the Croft Books.

Starting right in with the ABC's of modern electricity, Croft takes you through his books in easy steps. He gives you the boiled-down records of every-day electrical practice in plain words, figures and illustrations. Nothing is left to the imagination—there is no guesswork.

Croft has been through the mill. His knowledge of electricity has been gained by actual shirt-sleeves contact with electrical problems. He knows just what is needed to get ahead. He has poured out all his knowledge—all his experience—in language that anyone can grasp. Yet the text is so scientifically correct that thousands of the highest paid electrical engineers are using the books as a reference set.

The famous set is beyond the shadow of a doubt the last word in practical electrical education. No one who wishes to get anywhere in the electrical field can afford to be without it.

10 Days FREE TRIAL Just Mail the Coupon!

No Money Down—Small Monthly Payments

So that you may test our statements—so that you may compare the Croft Books with others, we offer to send the complete library of 8 volumes to you for 10 days' free examination. We take all the risk—pay all the charges. You assume no obligation of any kind—you pay nothing unless you decide to keep the books, in which event you pay $1.50 in ten days and then $2.00 a month for nine months.

Send the coupon now and see the books for yourself. It's a little thing to do but it may prove to be the best move you ever made in your life.

Thousands of Facts at Your Finger Tips

The Croft Library contains three thousand pages, with twenty-one hundred of the clearest illustrations ever put into book form. Each of the eight flexible pocket-sized volumes is indexed so that everything you need to know is right at your finger tips.

Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—installation, operation and repair of electrical machinery—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—how to do a complete job, from estimating it to completion—illumination in its every phase—the latest and most improved methods of lighting, etc.

59,000 Croft Sets Now in Use

Everywhere the Croft Library is acknowledged as the standard—the leader—in practical electrical training. It is the daily guide of 59,000 highly paid electrical workers and engineers. There is nothing like it in print today. It is the most complete, the best illustrated, the most carefully compiled, the most easily understood library. No matter how much or how little you know of electricity you will find the Croft Library a sound, helpful guide to greater accomplishment.

McGraw-Hill Book Co., Inc.,
370 Seventh Avenue, New York.

Gentlemen—Please send me the CROFT LIBRARY OF PRACTICAL ELECTRICITY (shipping charges prepaid), for 10 days' free examination. If satisfactory, I will send $1.50 in ten days and $2.00 per month until $19.50 has been paid. If not wanted, I will write you for return shipping instructions. (Write plainly and fill in all lines.)

Name .....

Home Address.....

City and State.....

Employed by.....

Occupation SI-11-27

www.americanradiohistory.com

"What would I do if I lost my job?"

SUPPOSE your employer notified you to-morrow that he didn't need you any longer? Have you any idea where you could get another position?

Don't have this spectre of unemployment hanging over your head forever. Train yourself to do some one thing so well that your services will be in demand. Employers don't discharge such men. They *promote* them!

Decide to-day that you are going to get the specialized training you must have if you are ever going to get—*and keep*—a real job at a real salary. It is easy if you really try.

Right at home, in the odds and ends of spare time that now go to waste, you can prepare for the position you want in the work you like best. For the International Correspondence Schools will train you just as they are training thousands of other men—no matter where you live—no matter what your circumstances.

At least find out how, by marking and mailing the coupon printed below. There's no cost or obligation, and it takes only a moment of your time, but it may be the means of changing your whole life.

Mail the Coupon To-day!

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6207-E Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X:

BUSINESS TRAINING COURSES

☐Business Management	☐Salesmanship
☐Industrial Management	☐Advertising
☐Personnel Organization	☐Better Letters
☐Traffic Management	☐Show Card Lettering
☐Business Law	☐Stenography and Typing
☐Banking and Banking Law	☐English
☐Accountancy (including C.P.A.)	☐Civil Service
☐Nicholson Cost Accounting	☐Railway Mail Clerk
☐Bookkeeping	☐Common School Subjects
☐Private Secretary	☐High School Subjects
☐Spanish	☐Illustrating
☐French	☐Cartooning

TECHNICAL AND INDUSTRIAL COURSES

☐Electrical Engineering	☐Architect
☐Electric Lighting	☐Architects' Blueprints
☐Mechanical Engineer	☐Contractor and Builder
☐Mechanical Draftsman	☐Architectural Draftsman
☐Machine Shop Practice	☐Concrete Builder
☐Railroad Positions	☐Structural Engineer
☐Gas Engine Operating	☐Chemistry ☐Pharmacy
☐Civil Engineer	☐Automobile Work
☐Surveying and Mapping	☐Airplane Engines
☐Metallurgy ☐Mining	☐Agriculture and Poultry
☐Steam Engineering ☐Radio	☐Mathematics

Name.....

Street Address.....

City.....State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian Limited, Montreal

Free Wholesale Radio Catalog
Send for it today
1928 Catalog
Dealers, set builders—make this your biggest radio season. Shure's great wholesale catalog insures the best in quality at lowest prices.
This wonderful book is jammed full of the newest offerings of Nationally known radio parts, kits, sets, accessories, table and console cabinets, etc. Also contains short wave sections showing the finest electrical apparatus for short wave receiving and transmitting. Your request brings our book of a thousand bargains, price list and discount sheet. Write for a copy today.
1928 WHOLESALE CATALOG of RADIO Sets, Kits and Everything in Radio
2000 Items
Big Values
Shure Radio Company
339X West Madison St., Chicago, Ill.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 230 Fifth Ave., N. Y.

The Modern Shell Game

By BERYL DILL KNEEN

(*Continued from page* 592)

problems are eventually solved, stock will be offered, if at all, by reputable concerns—and will still be a gamble for those of limited means.

INVENTORS OFTEN EXPLOITED

The inventor is often equally the victim with the public. There are numerous good devices and articles invented, but few indeed of these are as sound commercially as they are mechanically. That a device works, is no guarantee that it can be sold at a profit. Many of the men who worked out the ideas for the most advanced inventions of their time, found their ideas of no monetary value to them. The inventors of devices are frequently preyed upon by promoters; often the model works well enough so that the public is easily persuaded to buy shares in its future. Unfortunate is the inventor who gets in the hands of men who regard his device only as a peg for stock sales. The failure of the scheme and its eventual exposure frequently drag an honest-minded inventor into obloquy. Experience has shown that until a group of solid and well-financed business men are behind the proposition, its chances may be said to be nil. It is seldom, if ever, that you or I have a chance to invest safely in a legitimate undertaking, until it has gone through long and expensive development. Although the original backers of Henry Ford made millions, tens of thousands of investors in the stocks of automobile and accessory concerns have lost their money, probably more through mismanagement and the rapid evolution of the industry than fraud.

AUTOMOBILE SWINDLES

Yet the files of state and municipal offices and Better Business Bureaus, are crammed with instances of deliberate swindles in the automobile line. A patented brake and axle served as the nucleus for three companies in succession, each of which sold as much stock as possible and then passed the patent rights along to its successor. Before the state attorney-general stopped this form of perpetual promotion, the three concerns had collected $475,000, but had never attempted to manufacture its product.

One of the largest automobile stock-selling enterprises in recent years garnered $2,000,000 in one state alone; during a six-year period the so-called factory produced a total of eight cars of a "revolutionary" design. Unless the management of a new automobile factory is widely experienced in selling, producing and designing cars and is well-financed, investment in it may be entered under the head of "charity."

Almost a sure test of the genuineness of a new automotive project is the attempt by the promoter to show what you might have made if you had invested $100 in Ford's company some twenty years ago. There are few Henry Fords in the industrial world, and past opportunities in his line have no bearing upon the future. Yet in a small city a company issuing literature highly seasoned with Ford statistics, and with a picture of an imposing building quite devoid of machinery, was able to collect $90,000 in two or three years. Conversation and a shiny "advance model," made up of parts from various cars, induced hundreds to buy stock up to the very day the bubble burst.

PARKS
Manual Trainer
$35.00
Without Motor

For your home shop! Combination 11-inch band saw and 11-inch wood-lathe. If you have a knack for wood-working you can turn out first-class bridge lamps, cabinets, furniture, ship models, etc., in fast time. Get one! Write for specification circular
THE PARKS WOODWORKING MACHINE CO.
1553 Knowlton Street Cincinnati, Ohio
Canadian Factory: 208 Notre Dame, E. Montreal, Can.

Don't Envy The Plumber
BE ONE
$11.00-$16.00 PER DAY and work EVERY day, is the Plumber's wage.
Every skilled workman will tell you that Plumbers have the best of it. WINTER and SUMMER the Plumber is busy at top wages. No skilled Plumber is ever out of a job—compare his opportunities with any trade, plus the opportunities of having your own shop.
We teach you Plumbing with TOOLS (not books) under Licensed Master PLUMBERS in one of the finest equipped schools in America. We make you a Plumber, every branch is taught thoroughly—Lead Work—Blue Print for plan reading—all other tricks.
LEARN IN 8 TO 12 WEEKS without previous experience.
If you are making less than $60.00 a week you owe it to yourself to investigate. Get FREE catalog that tells in pictures and words how we teach this trade. Special rates now.
UNIVERSAL PLUMBING SCHOOL
2057 Troost Ave. KANSAS CITY, MO.

RADIO ACCESSORIES at WHOLESALE
Radio Sets, "B" Eliminators, Chargers, Tubes, Kits, Parts—everything new in Radio at lowest wholesale prices. Thousands of nationally advertised bargains. All listed and illustrated in my Big New Catalog and FREE Call Book.
132 Pages of valuable Radio information—trouble finding, set building—Radio knowledge of all kinds. Write today. HARRY SCHWARTZBERG PRES.
FREE
BIG BARGAIN CATALOG
AMERICAN AUTO & RADIO MFG. CO.
Dept. 274 American Radio Bldg.
Kansas City, Missouri

EARN MORE MONEY
YOU HAVEN'T A CHANCE UNLESS YOU CAN READ BLUE PRINTS
You may be a first-class mechanic but if you can't read blue prints you haven't a chance for a good foreman's job. By my simple method I train you quickly. Learn how men of your ability have succeeded.
Send Today for Facts—*State Trade*
CARROLL L. RUMSEY
Dept. S-4 Drexel Bldg., Phila.

DEAFNESS IS MISERY

Multitudes of persons with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Antiseptic Ear Drums. Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are Unseen Comforts and inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

A. O. LEONARD, Inc., Suite 785, 70 5th Ave., New York

Send for "The Nestler Plan"
It will bring you Big Profits!
This book fully explains the amazingly successful Nestler method of servicing and retreading automobile tires. Tells how to start a profitable spare-time or full-time Nestler business of your own. Write to Dept. 2N.
NESTLER RUBBER FUSING CO., Inc.
245 West 55th St. New York, N. Y.

Insure your copy reaching you each month. Subscribe to SCIENCE and INVENTION—$2.50 a year. Experimenter Pub. Co., 230-5th Ave., N. Y. C.

www.americanradiohistory.com

AUTOMATIC TRAIN CONTROL SCHEMES

In order to decrease railroad accidents the Interstate Commerce Commission a few years ago ordered the companies to install some form of automatic train control, which will eventually cover their entire mileage. This order resulted in thriving crops of stock-sellers, most of whom produced only miniature models of working apparatus. Some of the devices were legitimate and ingenious. Others were merely thrown together, and one company operating in the East, after having sold $900,000 worth of stock, *still had an unperfected mechanism!*

Few of those who "financed" this concern realized that railways naturally buy control equipment from a very few sound concerns managed by experienced men, who have already developed devices to withstand the stress of railroad operation. Uniform control equipment is almost as essential as standard-gauge tracks. So stock in these struggling devices, even if they work and are fool-proof, is hardly suitable for most of us.

NEW FUELS—EXAMINE CAREFULLY!!!

The scientific search for new fuels has given many a promoter an idea that furnished him a large residence on Easy Street. The average person is rather wary of these processes, which have so often proved impracticable commercially, so one ingenious individual decided to produce the good old gasoline by a "secret" method of his own. To the authorities he demonstrated a bewildering mass of pipes and machinery, which, with considerable hocus-pocus, produced a pint of high-grade motor spirit. Further investigations, during the "inventor's" absence, revealed a compartment with a store of regularly refined gasoline ready to issue from the spout. An injunction stopped the machine and its promoter.

The petroleum industry has suffered heavily from promotion, not a few of the losses being directly due to poor advice and to mismanagement. It may cost $100,000 or more to drill down several thousand feet, and such holes have been known to miss a pool by only a few yards. So this is a field for men with plenty of capital who can afford to charge off the cost of dry wells and expensive explorations of new fields. The fact that John D. Rockefeller made millions from oil, much of it through improving the distribution and use of oil products, is no indication that you or I will get rich through buying oil stock from a smooth salesman. In fact, it rather indicates the reverse.

WONDER ORE LOCATORS

Devices for discovering minerals hidden in the earth make fine "pickings" for the promoter and fake inventor. Although the divining-rod belongs to a past generation, the development by a scientist of an apparently successful galvanometer, sensitive enough to respond to masses of metal underground, caused a new crop of divining-rods to spring from the ever-fertile brains of "easy-money" men. Perhaps the very crudest consisted of a tripod from which a plumb-bob was suspended on a string; the operator laid a penny on his finger and twisted the string around both. The copper penny was said to give the device a mysterious attraction for copper, as indicated by the swinging bob. When the bob swung in his direction, the investigator was told that it was probably attracted by pennies in his pockets, though the device ignored other nearby coppers. The attraction was strong enough to remove some currency from pockets of the unsophisticated to those of the diviner.

"LAKE OF TREASURE"—AHA!

Little over a year ago the U. S. Post Office Department caused a fraud order to be issued against a corporation which had

DON'T BE LAUGHED AT
FOR
Your Physical Weakness

STRONGFORT
Builder of Men

ARE you a poor, spineless wretch that dreads to ask a girl to dance with you? Are you afraid to mingle with the crowd? Do you stand by watching the other fellows dancing and laughing and making a big hit? Why be such a boob? You know you ought to be just as good as they are. Do you lack nerve? Do you lack manly courage? **Don't let men laugh at your weakness! Don't let women sneer at you!** Your weakness and timidity bars you from all kinds of enjoyment socially, and makes you unfit for marriage.

Wake up and realize that to command love, admiration and respect, you must be physically fit -a **real 100 per cent. man**—with vigor and strength and stamina. You must BUILD UP YOUR BODY if you are weakened from excesses, neglect, stimulants or disease.

What Weakness Worries You?

What physical defect or mental worry robs you of bodily pleasure and the joys of life? What keeps you from attaining favor with men and women? Maybe you know, deep down in your own heart, what keeps you down—what makes you ail and fail—what puts you in the weakling class. No matter what the cause, nor how far below par you have been dragged, Lionel Strongfort wants you to know that you can be a vigorous, muscular, manly fellow in every way.

Take Heart, Young Man

There is hope for you. You can be "the life of the party"—popular at the dance. All you need is a little self-confidence—a little nerve. STRONGFORTISM will help you attain it. **It will give you manly strength!** STRONGFORTISM will build up that body of yours in such a way as to make a brand new fellow out of you. It will make you fit for any physical task—give you pep and punch. You will radiate health and good cheer. You won't be afraid of anything or anybody. In society you'll be an outstanding fellow—one sought after by women and played up to by men. In business you'll command success. In sport you'll be in the spotlight.

STRONGFORTISM
Will Work Wonders

Through Strongfortism you can become a real he-man—a powerful, vigorous, courageous fellow. It will lead you to fullest enjoyment of life physically and mentally, as it has led thousands who have been revitalized by Lionel Strongfort's methods. No dope. No drugs. No apparatus. **Cut out all dope and poison booze.** Forget all **artificial stimulants** and get back to Nature—to your muscular mechanism, and get strength and stamina and health at its source. Be a good sport—**give Nature a chance!** Let Nature build up your body and increase your muscular strength as nothing else in the world can do it.

Strongfort methods give to you speedily a bodily feeling so new, so different, that you are like a man reborn—vibrant with life, bubbling with energy, eager for contact with others, full of ambition and pep. Results are truly marvelous. Thousands testify to this fact.

Write for My FREE BOOK

"Promotion and Conservation of Health, Strength and Mental Energy"—a revelation of inside facts about the human body that makes it priceless to men seeking to banish vitality-sapping ailments, weakness unfitting them for marriage and consequent mental depression. I will be glad to send it to you Free. WRITE TODAY for your copy.

STRONGFORT INSTITUTE
LIONEL STRONGFORT, DIRECTOR.
Physical and Health Specialist
DEPT. 403 NEWARK, N. J., U. S. A.

Send This FREE Consultation Coupon
ABSOLUTELY CONFIDENTIAL

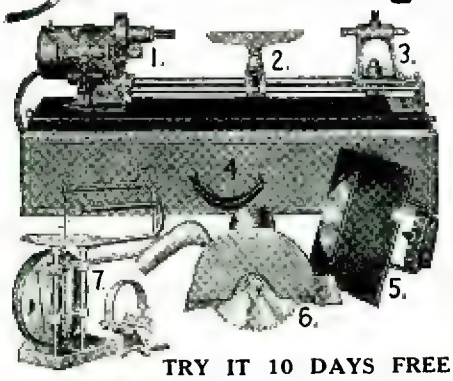
Mr. Lionel Strongfort, Strongfort Institute, Dept. 403, Newark, N. J.—Please send me absolutely free my copy of your book, "PROMOTION AND CONSERVATION OF HEALTH, STRENGTH AND MENTAL ENERGY." I have marked (x) before the subjects in which I am most interested.

..Catarrh	..Overweight	..Great Strength
..Colds	..Constipation	..Lung Troubles
..Asthma	..Weak Back	..Round Shoulders
..Headache	..Weak Eyes	..Stomach Disorders
..Rupture	..Rheumatism	..Increased Height
..Thinness	..Nervousness	..Muscular Development
..Pimples	..Short Breath	
..Insomnia	..Weak Heart	

Private Ailments .....
Name .....
Age ..... Occupation.....
Street .....
City ..... State.....

www.americanradiohistory.com

Speed Way Shop



TRY IT 10 DAYS FREE

Use the coupon today and have the privilege of using a SpeedWay Shop in your own home 10 days free. Our big catalog describes 9 models of Shops, Job men, Contractors, Builders and all sorts of manufacturers are cutting costs and increasing profits with them.

8 MOTOR DRIVEN TOOLS

Illustrations show complete working accessories to be used with SpeedWay Shop.

1. SpeedWay Drill mounted; with Nos. 2 and 3 this makes complete lathe.
4. Metal carrying case with handle.
5. Saw table and 6 inch blade.
6. Attachments to make Portable Saw.
7. Jig Saw and attachments.
8. Handle to make Portable Drill.
9. Leatherette Case for small parts.
10. Buffer wheel for polishing.
11. Wire Scratch Brush.
12. Emery Wheel—3 inches.
13 to 20. Small parts, tools, etc.

HAVE FUN OR MAKE MONEY

Dozens of men have set themselves up in business with a SpeedWay Shop. In the basement it forms the finest relaxation for professional men and others who love to work with tools.

ONLY $10.00 DOWN

Our terms are very easy. We ship on a down payment of only $10.00 which is refunded if you do not keep the Shop. Balance is paid in easy monthly payments, while you use it.

24 FREE BLUE PRINTS

With each Shop we furnish free 24 working blue prints of toys, furniture, pergolas, etc.

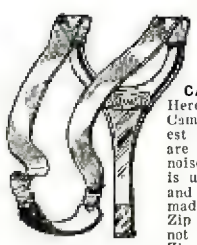
Write for Free Trial Offer

Use the coupon today. Remember, this is the only company in the world making a complete line of Portable Electric Saws, Hammers, Drills, Shops, etc.

ELECTRO MAGNETIC TOOL CO.
Dept. 3-N, 1830 S. 52nd Ave.,
Cicero, Ill. (Adjoining Chicago)
Please send me free trial offer on Shops.

Name .....

Address .....



ZIP-ZIP SHOOTER

CAMPERS AND TOURISTS: Here is the very thing for you. Campers tell us that this is the greatest weapon to be had where firearms are prohibited. Zip-Zip Shooter is noiseless, powerful and effective and is used by a great number of tourists and campers. Thousands of boys are made happy with this wonderful Zip-Zip Shooter. If your dealer happens not to have them order from us. Zip-Zip Shooter, 35c or three for $1.00

AUTOMATIC RUBBER CO., Dept. BB, Columbia, S. C.

$25.00 A Day Profit

You and the wonderful new HB Paint Spray Outfit can do the work and get the wages of 5 men with brushes. Paint Autos, Houses, Barns, Factories and Furniture—do any paint job in one-fifth the usual time.

Painting By New, Quick Method! No special experience necessary. Pays for itself on easy monthly payments with practically no expense to you. Full information in Bulletin S1171.

Hobart Bros. Co., Box S1171, Troy, O.

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 230 Fifth Ave., N. Y.

used the mails for four years to extol the merits of a western *Lake of Treasure,* supposed to be overflowing with valuable borax and potash. This company "conservatively" estimated that "$100 invested now may return as much as $34,140," for which rather more conservative chemists failed to find a basis. Promotion costs alone used up almost one-half of the half million collected.

GOLD FROM LEAD!—WHAT???

From time immemorial, the changing of a base metal into one more valuable has fascinated mankind, and today few communities are entirely immune from schemers who claim the power of transmutation. In a recent swindle of this type some $200,000 was subscribed, and several reputations suffered when the promoters were haled into court, to prove their ability to change lead into silver or cease selling stock. Needless to say they were ordered to sell no more stock. An engineer of standing had been so thoroughly sold on this scheme that he had invested considerable money and had urged friends to do likewise. As with the majority of such frauds, the silver was found to have been "planted," and the promoters went to jail.

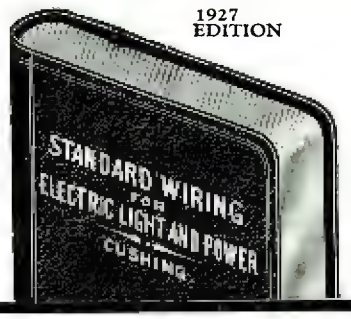
One of the prime movers in this affair deserves the title of "king of the confidence men." When arrested he was the only one of the group unable to raise bail. Among his victims was an old woman who had put all her savings into his scheme. Bewildered by what had happened, she visited the crook in his cell, and there he talked so convincingly that she mortgaged her house for $2,000 to go on his bond. Once out of jail he promptly left the state and is the only one of the band not now serving a sentence.

A German chemist in an eastern city offered a variant of the transmutation scheme by asserting he could increase the gold yield from ore more than one hundred times over the present average. He claimed to be able to take from $800 to $3,000 per ton from low-grade ore. In a laboratory which was a maze of pipes, retorts, boilers, stoves, simmering acids, electric furnaces, crucibles and smelting apparatus, he demonstrated by actually taking $800 worth of gold from a ton of clay which government experts declared showed only a trace. From dump leavings of large smelters he stated he had obtained $138 per ton. University chemists tested the same dump and obtained 23 cents per ton, far less than the cost of recovery. By the time the authorities had satisfied themselves that the gold was being introduced before smelting, considerable stock had been sold. The stock-fraud law was invoked, sales stopped and the chemist left suddenly for Canada, where he is said to be still operating. The propaganda in this scheme began with the claim that the originator was able to recover gold that present methods overlooked, but being hard pressed, he ended with assertions that in reality he added secret elements that converted part of the ore into gold. Valuable elements!

PLATINUM SWINDLERS PLENTIFUL

The same man was involved in an iridio-platinum swindle similar to his gold fraud. $100,000 worth of stock was sold in two years in the platinum project, which claimed to get the valuable metal from materials that do not contain platinum. Up to the time of going to press, no returns from this scheme had accrued to the investor, save such as might be entered under the head of "experience."

Platinum mines have been favored by swindlers since the vogue of this pale metal has grown. The "discoverer" of an alleged platinum mine showed samples of ore and sold stock, declaring he was giving "the people" a chance for wealth by barring the



LEARN WIRING
And Earn $75-$100 a Week

496 Pages—390 Illustrations

Thousands of young men have become expert wiremen through the simple rules and tables given in Standard Wiring.

No wireman is ever out of a job

It contains The National Electrical Code explained and illustrated. New illustrated chapters on Outside Wiring and Inside Wiring for all systems for both direct and alternating currents: House and Residence Wiring, Garage Wiring, Theatre and Moving Picture House Wiring, Marine Wiring, Electric Sign Wiring, Radio Wiring.

How to install, operate and care for Generators, Motors, Storage Batteries, Meters, Electric Ranges and every kind of wiring device for light, heat and power and Radio Wiring.

Leather Cover Gilt Edges, Pocket Size. Sent Post Paid on receipt of Price $3.00

H. C. CUSHING, Jr.
13 WEST 55th STREET NEW YORK

5 TUBE RADIO ONLY $19.98

It's a wonder for power and selectivity. Famous ARL circuit. Coast to coast reception! Finely built of selected, tested parts. Thousands now in use. FREE Log and Call Book and New 132-p. Catalog with thousands of nationally advertised bargains. Latest in radio at big savings. Write for Free copy.

AMERICAN RADIO BARGAINS

AMERICAN AUTO & RADIO MFG. CO.
HARRY SCHWARTZBERG, PRES.
Dept. 271 American Radio Bldg., Kansas City, Mo.

TEN MAGAZINES for 10

10¢ NOW

The smartest, most interesting, entertaining and instructive Magazine in America! *10 weeks for only 10c.* Special introductory offer. No magazine like it. Full of important facts, pictures and the best, most popular fiction for all members of the family. Send name, address and 10c today. The Pathfinder, Dept. P-271 Washington, D. C.

$35 builds this set in your spare-time!

The World Famous "NEUTRODYNE"

There are reasons why the "Neutrodyne" has been the leading Circuit for years. It gives quiet operation, no-oscillating and good power.

It's easy to tune—*and easy to build.* You can save many dollars by building your own Neutrodyne, using the famous Consrad Pattern.

Use This Consrad Pattern 50c

This Pattern gives 2 full sized blueprints 16x30 inches of the Panel layout and Wiring diagram, also a 4-page, illustrated, instruction Booklet. The Consrad method of building is the simplest ever devised. Anyone can build from it.

THE CONSRAD CO., Inc.
230 Fifth Ave., New York City
Enclosed send 50c for one copy of your "Neutrodyne Pattern."

Name .....

Address .....

City ..... State.....

www.americanradiohistory.com

"grasping" capitalists. When he was finally cornered and his ore tested, no trace of *any* metal of value was found. He had taken in $90,000.

There is an increasing number of frauds and losses from investment in articles and inventions that are mechanically good. A great variety of egg beaters, new wrenches, combination tools, automobile accessories, etc., are being devised by inventors. If the models stand the tests of expert engineers and actual use under working conditions for at least two years, during which time a patent should be applied for, then the inventor should endeavor to interest a large concern already making similar devices. It is always a good move to endeavor to interest a few friends in financing the manufacture of a few hundred of the tools in a good shop. These should be offered for sale as soon as possible in order to test the demand. This will also develop the actual cost of manufacture, a test which many new articles fail to pass. In this way the interest of the manufacturer is more easily aroused. for many are seeking new products *provided they will yield a profit.* It is often up to the inventor and his friends to determine this himself.

In developing inventions a small group of backers will sometimes begin operations with honest intent, soon find their money exhausted, and still believing they can make the project go, launch several stock sales in succession. When the proceeds promise no results they are stopped, but rather too late for the stockholders. Amateurs in business often think in huge sums, pay large salaries to all, and are astonished when their capital vanishes without tangible result.

A "CUTTING GAME" IN SCISSORS

A corporation formed to manufacture scissors with removable blades, apparently a really serviceable article, sold $800,000 worth of bonds in three years. With only $23,000 in current assets left, the factory closed and heavily mortgaged, and the machinery in storage, the firm opened the sale of another $100,000 of debenture bonds, when stopped by authorities. The head of the company went to prison. In this case part of the funds had been dissipated by selling the scissors at less than cost in order to influence stock sales.

Another corporation capitalized the recent wave of bank robberies and hold-ups, by floating a stock issue based on a bullet-proof and non-shatterable glass. Under a pretense of applying for an agency, the promoter obtained a piece of such glass from a well-known manufacturer. He used this piece to stage a demonstration at a metropolitan police station and later used the favorable police report on the test, inserting the name of his fraudulent concern as manufacturer of the glass. About $2,000,000 worth of stock was sold and it was found that the promoters had diverted much of the money to their own uses. The post office presented evidence at the trials that the firm had no patents on non-shatterable glass, that it had never manufactured any commercially, and that it had untruthfully claimed to have factories in New York, New Jersey, Pennsylvania and Canada. One of the principals pleaded guilty and turned State's evidence to get a light sentence, which aided in the conviction of the group. The case is notable for the amount of money obtained through the use of another company's product.

SCIENCE AND THE FAKERS

It is hard to find a field of mechanics and science that has not been touched by the faker. New inventions or scientific processes that attract popular interest are often followed hy fraudulent imitators. There are even dishonest technical schools. A large

Suddenly I Broke Away

and Held Them Spellbound

As I review that tense, dramatic moment when I electrified that meeting, it all seems strange and weird to me. How had I changed so miraculously in three months from a shy, diffident "yes" man to a dynamic, vigorous he-man? How had I ever dared give my opinion? Three months before nobody ever knew I held opinions!

ALL my life I had been cursed with a shy, timid, self-conscious nature. With only a grammar school education I could never express ideas in a coherent, self-confident way. But one day my eye fell upon a newspaper article which told about a wonderful free book entitled *How to Work Wonders with Words*—a book that was causing widespread comment from coast to coast—a book that was being read not only by millionaires, but by thousands of others. It discussed men like me and explained how we could overcome our handicaps.

At first I was skeptical. I thought these defects were a part of my natural make-up—that I would never be able to overcome them. But some subtile instinct kept prodding me to send for that free book. I lost no time in sending for it, as I was positively amazed at being able to get cost free a book that made absolutely plain the secrets that most successful men have used to win popularity, distinction, money and success.

As the weeks wore on and I absorbed the principles of this remarkable method, I became conscious of new physical and mental energy, a new feeling of aggressiveness, and a resurrected personal power that I never dreamed I possessed. Then came that day in the general meeting when the president called on the assembled department heads and assistants for suggestions on the proposed new policy.

Three months previously, the forces of indecision, timidity, and inability to talk in public would have held me to my seat. But suddenly that new power took possession of me and drove me to my feet. That wonderful 20-minute daily training at home had taught me to forget myself and think only of my subject. Almost automatically the ideas which had heretofore lain dormant in a mental jumble, now issued with a vigor, clearness and enthusiasm that astounded me no less than my boss and associates. And I noticed with silent exultation the rapt, intent look on my audience as my story unfolded itself smoothly and eloquently.

To-day the men whom I used to greet deferentially I now meet with an air of cool equality. I am asked to conferences, luncheons, banquets, etc., as a popular after-dinner speaker. And my talents are not confined to business matters but have made me an interesting conversationalist at social affairs. I am meeting worth while people, I own a good job, a good home, a good car. I am the happiest man that ever lived.

And I frankly and candidly admit that I owe all of these blessings to that wonderful little free book *How to Work Wonders with Words.*

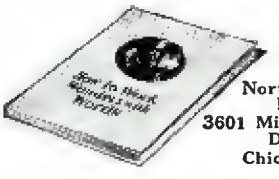
What 20 Minutes A Day Will Show You

How to talk before your club or lodge
How to address board meetings
How to propose and respond to toasts
How to make a political speech
How to tell entertaining stories
How to make after-dinner speeches
How to converse interestingly
How to write better letters
How to sell more goods
How to train your memory
How to enlarge your vocabulary
How to develop self-confidence
How to acquire a winning personality
How to strengthen your will-power and ambition
How to become a clear, accurate thinker
How to develop your power of concentration
How to be the master of any situation

Send for this Amazing Book

This new method of training is fully described in a very interesting and informative booklet which is now being sent to everyone mailing the coupon below. This book is called *How to Work Wonders with Words.* You are told how to bring out and develop your priceless "hidden knack"—the natural gift within you—which will win for you advancement in position and salary, popularity, social standing, power and real success. You can obtain your copy absolutely free by sending the coupon.

NOW SENT FREE



North American Institute, 3601 Michigan Ave., Dept. 1428, Chicago, Illinois

NORTH AMERICAN INSTITUTE,
3601 Michigan Ave., Dept. 1428,
Chicago, Illinois.

Please send me FREE and without obligation my copy of your inspiring booklet, *How to Work Wonders with Words,* and full information regarding your Course in Effective Speaking.

Name .....

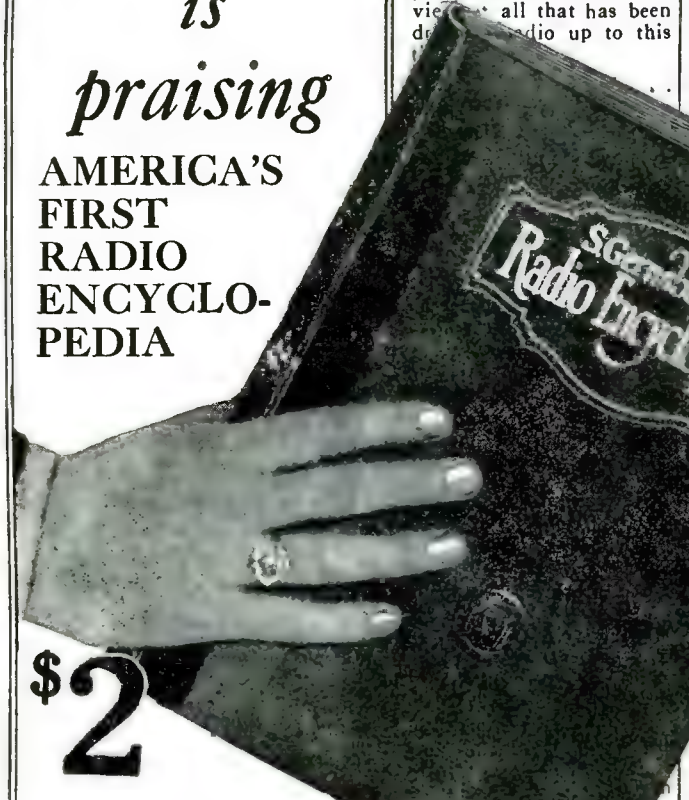
Address .....

City ..... State.....

www.americanradiohistory.com

The whole COUNTRY *is praising*

AMERICA'S FIRST RADIO ENCYCLOPEDIA



$2

A place in every home, every library, every laboratory

S. GERNSBACK'S RADIO ENCYCLOPEDIA is the only standard work ever published in America attempting to classify alphabetically the countless words used in the highly specialized science of RADIO. The ENCYCLOPEDIA is written in plain English so that everybody can understand the definitions and descriptions.

No expense has been spared, covering over two years in compilation, to make it worthy a place in your library.

It is published in one volume—168 pages—size 9x12 inches, nearly an inch thick and nicely accomodates the beautiful illustrations and the large, easy to read type.

Every page is replete with illustrations—to make the text easily understandable.

REMEMBER THIS IS A REAL ENCYCLOPEDIA — NOT A DICTIONARY.

The book contains as a supplement a classified cross-index designed to bring together radio references under one heading having relations in common.

All circuits new and old are described by word and picture.

The work contains 1,930 definitions, 549 photographs, drawings and diagrams.

SEND NO MONEY—Just forward your name and address. We will send you the Book at once. You pay postman $2, plus postage on delivery.

Order Direct from

S. GERNSBACK

230 Fifth Ave., New York

NEW YORK, N. Y. . . . It is the best work of the kind we have ever seen and shows considerable painstaking and laborious effort.—*Telegram.*

NEW YORK, N. Y. . . . The volume amounts to practically a compact re- all that has been dio up to this

. . .

ws.

NIA Y. . . . The y be recommen in- informational use every radio listener.
—*Evening Review.*

BUFFALO, N. Y. . . . Here is the world of radio, all in one volume, and it is one of the most comprehensive, enlightening and illuminating publications that has yet been issued.—*Courier-Express.*

BRIDGEPORT, CONN. . . . All radio terms are fully described in layman's style, and the explanation of the whys and wherefores of various circuits are also given.
—*Herald.*

BOSTON, MASS. . . . A practical handbook with references covering every item of importance relating to radio.—*Globe.*

PHILADELPHIA, PA. . . . In his Encyclopedia Mr. Gernsback has succeeded in reducing high sounding electrical and technical terms to every day speech.—*Daily News.*

WASHINGTON, D. C. . . . It presents a complete classification of the latest authoritative data in radio.—*Evening Star.*

SAN FRANCISCO, CAL. . . . A book that will be of value to all that are interested in practical radio work.—*Examiner.*

PITTSBURGH, PA. . . . Many radio fans will be interested in the new Radio Encyclopedia by dney Gernsback.
—*Sunday Post.*

OH, PA. . . . ld be of engi- er-

. ec- ma- also to the ference

. . . It plete clas- the latest ive data in day Tribune.

N. Y. . . . Mr. k is author of other volumes radio and his en- pedia may be re- ed as authoritative.
—*Daily Press.*

HICAGO, ILL. . . . S. Gernsback has aimed to provide not merely a dictionary of radio terms but an actual ready reference, Encyclopedia.
—*Herald and Examiner.*

ST. LOUIS, MO. . . . S. Gernsback's new radio encyclopedia holds all needed facts.
—*St. Louis Star.*

ST. LOUIS, M. . . . book of radio information is S. Gernsback's radio encyclopedia.
—*Globe Democrat.*

MACON, GA. . . . Gernsback's radio encyclopedia fills a demand that has been made by every radio fan as well as technical expert since the industry has started.—*Telegraph.*

DALLAS, TEXAS. . . . This encyclopedia is readily understandable to anyone who reads English and is thorough and readable.—*Sunday News.*

LOS ANGELES, CAL. . . . Its references cover every item of importance relative to the radio industry—*Sunday Times.*

OTTAWA, CANADA. . . . It is an encyclopedia in the true sense of the meaning and not a mere dictionary.
—*Journal.*

S. GERNSBACK 230 FIFTH AVE., N. Y.

Send me 1 copy of your Radio Encyclopedia. I will pay postman $2 plus postage on delivery.

Name .....

Address .....

City .....

State .....

engineering society with the support of the Federal Trade Commission, has undertaken a campaign to stop poorly-prepared schools, and some even better ones, from making promises to turn out thoroughly-trained professional engineers in a few months and to place them at high salaries. Engineers are notoriously under-paid in relation to the years of training and experience required. Automobile mechanic schools, like the "diploma mills" that afflict the medical and other professions, have been found that certify the student to be a competent mechanic when his only training was the driving of a truck around the block!

The fraudulent concern has a harmful effect upon business and the fake inventor hurts the standing of legitimate experimenters. Yet no one wishes to discourage inventors from continuing to invent, or industrial concerns from starting business. But so many factors govern the question of profitable production today that every new project should have the advice of technical and patent experts and business men.

The prospective investor should govern himself by the advice of his banker and by the assistance given by the Better Business Bureaus. It is well to remember that a seemingly clever device is no indication of a fortune in the future. A machine that looks marvelous in demonstration may be obsolete, impractical, unpatentable, in a field already covered by other machines, too costly to manufacture or to maintain, have a limited market, be mechanically imperfect, or be otherwise non-commercial. It is a safe rule never to risk more than one-twentieth of one's surplus funds in speculative enterprises such as these. The man of limited means can no more afford to put up stakes on ingenious machines, transmutation of metals, cold light, manufacture of gasoline and other projects, no matter how plausible, than he can afford to gamble on the races or play roulette. He might pick the lucky horse or the winning number once in a great while, but in the promotional game the organizer deals the cards and his sleeves may be full of aces.

Efficient Search-light for $3.00

By CHARLES A. HALL

(*Continued from page* 616)

have a 6-32 hole drilled in the top of each to admit set screws. Bolt each of these to the two ends of the cross part of the "T," insulating one with asbestos. Next, cut two pieces of 3/16 inch brass strip each one inch long and bend each in half to form an "L." Bolt both onto the bottom of the perpendicular piece of the "T" so that the bottom of the "L" is flush with the end of the aforementioned "T." Now solder a bolt to the bottom of the "T" and the carbon holder is finished. Mount the whole in the bottom of the lamp, with the bolt on the bottom of the "T" through the slot in the lamp. Screw up the nut of the bolt and the carbon holder is in place and ready for use.

The source of power for the arc is the 110 AC lighting line. We have to have an impedance to prevent blowing the fuses. For this we wind on two layers of No. 18 cotton covered wire on a two inch core of sof iron or silicon steel.

Having completed the wiring according to the diagram, insert two carbons in the carbon holder and screw the set screws down. The distance between the two ends of the carbons should be about ¼ inch. To start the arc all that is needed is to bridge the space between the two carbons with another carbon. The arc will start and you can take the third carbon away.

www.americanradiohistory.com

The Rôle of Wave Length in Theories of Radiation

By F. K. RICHTMYER

(*Continued from page 607*)

way that the second at any given instant will tend to make the chip go down, while the first would tend to make the chip go up. The chip accordingly might be made to stand still, although two sources of waves are passing over it. These two wave trains would then be said to *interfere*. On the contrary, it is so impossible as to be quite ridiculous to imagine two streams of rain drops striking a surface from slightly different directions and producing dryness rather than wetness! The corpuscular theory of light could not, and can not now, explain this phenomenon of interference.

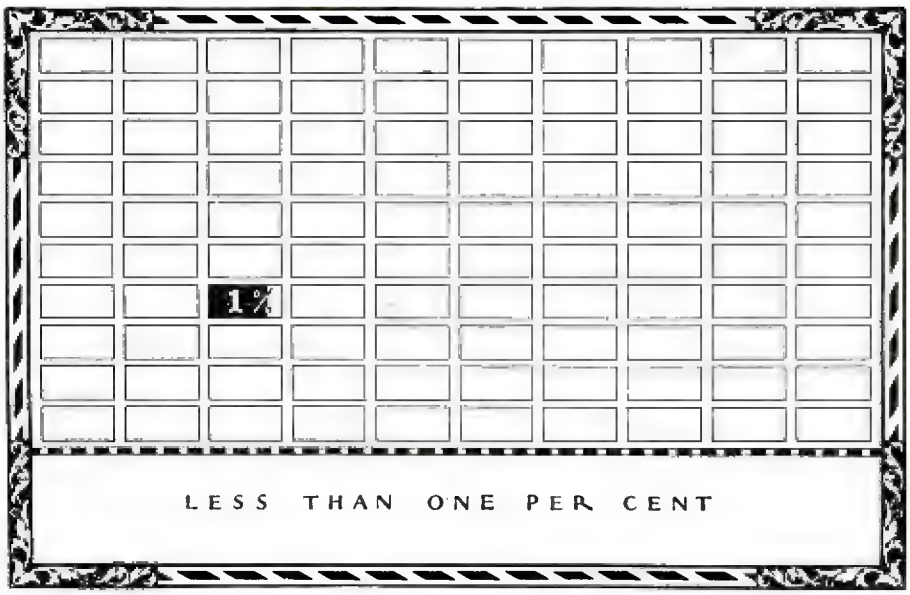
During the next four or five decades, Young's experiments were confirmed on every hand, and every newly discovered experimental fact seemed to confirm the wave theory, so that by the middle of the nineteenth century, there were few, if any scientists who believed in the corpuscular theory. At last, on the basis of good, sound incontrovertible experiment, the wave theory had triumphed.

Meantime in various ways experimenters have measured wave lengths of light. If you have stood on the shore and watched the breakers roll in I am sure that you have had no difficulty in appreciating the meaning of wave length. And it is a simple property of wave motion that the velocity with which the wave train moves, is equal to the product of the wave length multiplied by the frequency of vibration. Since the velocity of light was known, and since its wave length for the various spectral colors could be measured, the frequency corresponding to these various colors could be computed.

From 1850 until the present, our knowledge of these ether waves, as some of us are old-fashioned enough to call them, or more correctly, *electro-magnetic waves,* as the wonderful theory of James Clerk Maxwell proved them to be, has become very extensive. We have become very familiar with electro-magnetic waves of all kinds in connection with both pure and applied science, so that we are now acquainted with a vast gamut or spectrum of waves, extending from radio waves many miles in length, such as are in use to-day in trans-Atlantic radio-telephony, to the short waves emitted by radio active substances, so short that it takes billions of them to make an inch, which are used in treating cancer and similar maladies. Between these two extremes, we have the short electro-magnetic waves, a few hundredths of an inch long; the so-called *heat waves,* a few thousandths of an inch long; light waves, a few ten-thousandths of an inch long; ultra violet rays a few hundred-thousandths of an inch long, and X-rays a thousand times shorter than these. Nothing in the whole realm of physics, either pure or applied, seems more real than these electro-magnetic waves.

PHOTO-ELECTRIC EFFECT OF LIGHT

But let us go back exactly four decades in the history of physics to a time when Sigma Chi was one year old, namely 1887. In that year occurred another momentous event in the history of radiation. The German physicist, Heinrich Hertz, in that year discovered a new experimental fact, which was destined to play the same rôle in connection with the corpuscular theory of light as was the phenomenon of interference, discovered by Young, in connection with the wave theory of light. This discovery made by Hertz is called the *photo-electric effect.*



An Advertisement of the American Telephone and Telegraph Company

No ONE person owns as much as 1% of the capital stock of the American Telephone and Telegraph Company.

The company is owned by more than 420,000 people, with stockholders in every section of the United States. It, in turn, owns 91% of the common stock of the operating companies of the Bell System which give telephone service in every state in the Union, making a national service nationally owned.

The men and women owners of the American Telephone and Telegraph Company are the largest single body of stockholders in the world and they represent every vital activity in the nation's life, from laborer and unskilled worker to wealthy and influential executive. Although the telephone was one of the greatest inventions of an age of large fortunes, no one ever made a great fortune from it—in fact, there are not any "telephone fortunes." The Bell Telephone System is owned by the American people. It is operated in the interest of the telephone users.

TRAVEL FOR "UNCLE SAM"

Railway Postal Clerks

$158 TO $225 MONTH

Mail Coupon Before You Lose It

Steady Work—No Layoffs Paid Vacations

Travel—See Your Country

Common Education Sufficient

Men—Boys 18 Up

Franklin Institute, Dept. R177, Rochester, N. Y.

Sirs: Rush to me without charge 32-page book, "How to Get U. S. Government Jobs," with list of positions obtainable and full particulars telling how to get them.

Name.....

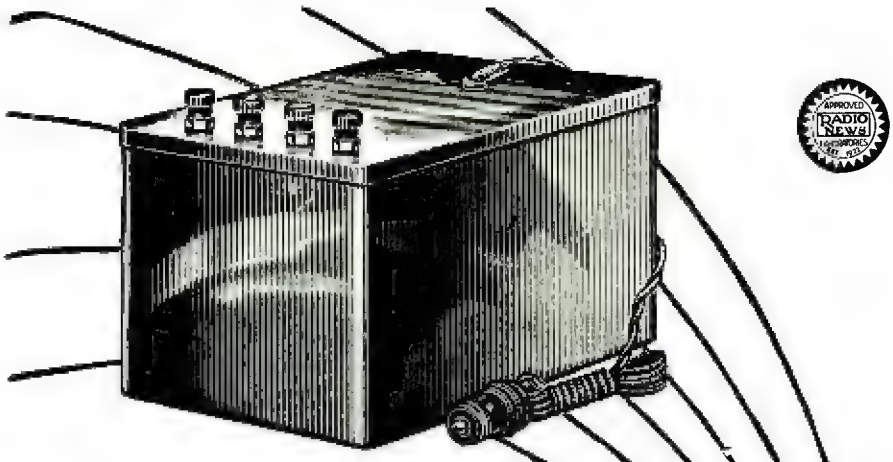
Address.....

Be My Candy Agent

Make big money. Sell chocolate bars, fruit drops, nut clusters, chewing gum and popular packages, 30 kinds. All fast sellers. I make the best. Season just starting. Free sample. Need agent at once. So answer this ad NOW.
Gordon Candy Co. 1416 Vine St. Cincinnati, O. Dept. 1471

WHY NOT spend Spring, Summer, Fall gathering butterflies, insects. I buy hundreds of kinds for collections. Some worth $1 to $7. Simple work with my Instructions, pictures, pricelist. Send 10c [NOT STAMPS] for my Prospectus before sending butterflies Mr. Sinclair, Dealer in Insects, Dept. 41 Box 1424, San Diego, Calif.

www.americanradiohistory.com



it's the Value behind the price that counts!

Because every part in the Townsend "B" Socket Power Unit is made and assembled in our own factory we can give you a high grade instrument at a surprisingly low price. Now everyone can enjoy wonderfully improved reception, uninterrupted by screeches of fading batteries.

Reports from hundreds of satisfied users prove that the Townsend "B" Socket Power is the most remarkable value in Radio today.

Money Back If Not Delighted

Sold on real guarantee of money refunded if not satisfied. Delivers up to 100 volts on any set, on D. C. or A. C. —any cycle. Full tone, clarity and volume.

Approved and passed by the rigid laboratory tests of Radio News and Popular Radio

SEND ORDER TODAY

Simply fill out the coupon and slip it into an envelope with only $1.00 and mail at once. Your Townsend "B" Socket Power Unit will be sent promptly. Deposit only $5.85 plus postage with the postman. Try out for 10 days—then if not amazed and delighted with improvement in reception, return it to us and purchase price will be refunded.

HERE'S YOUR PROOF

Your Eliminator is doing just fine; worth five times the price. H. R. Boyd, Urbana, Ohio.

Your Eliminator works very well. I get distant stations very strong and clear on my Browning-Drake. Geo. Bigras, Montreal, Canada.

I cannot praise your Eliminator too much. Better than many I have seen at many times the price. D. W. Beard, Los Angeles, Calif.

Have been using your Eliminator for several months and am well pleased with its reliability and economy R. Bond, San Antonio, Texas.

Your Eliminator on my "ROBERTS" is fine and clear; best I ever heard and no trouble at all. A. Saile, Passaic, N. J.

Reception with your Eliminator is so good and clear, it seems the artists themselves are in the room. Floyd Fry, Oakland, Calif.

More than pleased with your Eliminator. Bringing in stations that I never heard before. Levi O. Gabowry, Worcester, Mass.

complete $6.85 $1.00 Down Balance C.O.D.

Townsend "B" Socket Power

TOWNSEND LABORATORIES
713 Townsend St. Dept. 35
CHICAGO, ILL.

10 Days FREE TRIAL You are the Judge!

TOWNSEND LABORATORIES, 713 Townsend St., Dept. 35 Chicago, Ill.
Gentlemen: Attached find $1.00. Kindly send at once Townsend "B" Socket Power Unit, C. O. D. for $5.85, plus postage, on guaranteed 10-day free trial.
Name .....
Address .....
City ..... State .....

Attach Only $1.00 to this Coupon

BOUND VOLUMES at GREAT SACRIFICE

12 full issues of back magazines, handsomely bound in stiff cloth covers, tremendously valuable for reference and other uses, for sale at great price reductions to make room. Price, $2.50. Worth $10.00.

Science and Invention	May, 1923, to April, 1924
Science and Invention	May, 1925, to April, 1926
The Experimenter	Nov., 1924, to Oct., 1925
Practical Electrics	Nov., 1922, to Oct., 1923
Electrical Experimenter	May, 1917, to April, 1918

$2.50 EACH

EXPERIMENTER PUB. CO., Inc., 230 Fifth Ave., New York

Time does not permit an explanation of this phenomenon. Suffice it to say, however, that later experiments following those of Hertz, have shown that when light falls upon a metal surface under certain easily specified conditions, electrons are liberated from the metal by the action of light. Any one who has used the radio is, or should be, more or less familiar with the electrons which leave the heated filament in the vacuum tube and make possible modern radio transmission and reception.

By modern experimental methods we can measure very easily the number of such electrons which are emitted from a square inch of metal, when light of a measurable wave length and intensity falls upon the metal. We can also measure the velocity with which the electrons are caused to leave the metal and can, therefore, determine the energy which each one carries. We also have good evidence for believing that the electrons come from the atoms of the metal; and we can readily determine the number of atoms in a square inch of surface of the metal. Knowing the energy received each second by each square inch of the metal, and on the basis of the wave theory of light, assuming that each one of this vast number of atoms absorbs only its due proportionate quota from the radiant energy, we can compute how long it ought to take for an atom to absorb enough energy to expel an electron; even though we have no knowledge of the atomic mechanism involved. When we make a computation of this kind on the basis of indisputable experimental data, we find it ought to take several hours, or even days, before an atom can get enough energy from light to expel an electron. This should mean that it would be a long time after light falls upon a metal before electrons would be emitted from it. But as a matter of fact, so-called photo-electric emission begins instantly. Indeed, according to some measurements reported a few weeks ago in Washington at the meeting of the American Physical Society, the time lag, if any, between the beginning of photo-electric emission and illumination is certainly not more than a few billionths of a second.

QUANTUM PHENOMENA

It is practically impossible on the basis of the wave theory to explain the photo-electric effect and many similar phenomena which have been discovered in recent years, and which are now grouped under the general name of *quantum phenomena*. If, however, we were to assume with Newton, that light was corpuscular in its nature, it would be perfectly possible for us to explain many facts of the photo-electric effect and others related thereto. Indeed, in recent years these *corpuscles of radiant energy* have come to be almost as real in this branch of physics as have waves in connection with the wave theory of light. For example, we know the amount of energy carried by each corpuscle. This energy varies with the frequency of the light or radiation and is equal to a certain constant of nature, known as Planck's constant, multiplied by the frequency of light. This amount of energy is frequently spoken of as a *quantum* of radiation.

The situation, then, with regard to the theories of light is briefly this: On one side of an almost impenetrable fence is to be found a group of experimental facts, according to which we should say, without the slightest hesitation, that light is a *wave motion*. On the other side of the fence is another group of experimental facts, according to which we should say, without the slightest hesitation, that light is *corpuscular*, if we did not know what was on the first side of the fence. So far as reaching a categorical answer to the question, we are no nearer than were Huyghens and Newton. But there is this very fundamental difference between the present situation and that which

www.americanradiohistory.com

existed two hundred and fifty years ago, namely—we have in our possession a vast amount of experimental data, on the basis of which a decision may be reached.

There is further a curious cross relation between these two theories, which was not known to Huyghens and to Newton. I have stated that the energy of a light quantum is equal to the product of a certain constant and the *frequency* of the light. Now, it is a question which has never been satisfactorily answered as to what can possibly be the meaning of frequency in connection with a corpuscular theory of light. The frequency with which water waves pass the chip is a perfectly concrete thing. But what can possibly be the meaning of frequency as applied to a falling rain drop? Nevertheless, a quantum of radiant energy somehow is intimately connected with frequency. But in our experimental laboratories we do not measure the frequency of light waves directly. Indeed, we have no way of making such measurements. What we measure is wave length and velocity of light on the assumption that light is a wave motion and from these measurements we then *compute* frequency. This computed value of frequency, obtained on the theory that light is a wave motion, we then carry blindfolded over the fence and use in computing the energy of the quantum. It is possible that out of this cross connection between these two rival theories of light may come a practical means of harmonizing the two theories or of developing some entirely new theory to account for both groups of phenomena.

At any rate, scientists have learned a very important lesson by the experience of the past two and a half centuries. We have learned, for example, that it is not safe dogmatically to assert that any particular theory is finally correct and will, therefore, stand the test of time. We have learned to look for and to respect new experimental evidence and to revise our theories whenever they are found in conflict with experiment. It is this search for truth in all branches of science and the sincere interpretation of experimental data without bias, which has in large part made possible the tremendous advances in science, which advances have been contemporaneous with and perhaps not a little influenced by the Society of Sigma Xi.

How to Make a Sewing "Carry-all"

By H. L. WEATHERBY

(*Continued from page* 613)

joints of the upright pieces, completing the handle portion of the basket. Make the open mortise and tenon joints at the upper end of these posts as carefully as possible, so that the fit made be good and look good.

Now, glue with a good grade of cabinet glue, and nail together with small brads the sections of the handle, taking great care to keep the uprights parallel. Clamps may be used if desired and the nails dispensed with.

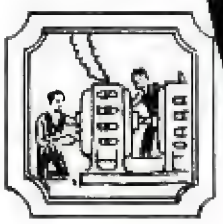
We are now ready to start shaping to size the plywood pieces, forming the basket portion of our "Carry-all". After squaring the parts to size, a coping saw may be used to cut to the curves, laid out in the same manner as that used with the handle. With file and sandpaper smooth the curved edges being careful again not to splinter the wood. Patterns for these parts should be drawn on cardboard or heavy paper, using the squares as indicated to plot the correct line. Nail the sides and ends together with 1¼" or 1½" brads before fitting the bottom. The bottom should be fitted with slightly beveled edges so that a perfect fit may be had. Nail it in place and then attach the

Be An Electrical Expert

Come to New York

See this wonderful city while learning a high pay profession

ACTUAL EXPERIENCE



PRACTICAL LESSONS

Enjoy the Wonders of New York the modern Bagdad while learning Electricity

OUR GRADUATES IN DEMAND.

Graduates of the NEW YORK ELECTRICAL SCHOOL are in demand by all the big electrical companies. Or, if you prefer the independence of a business of your own, there are thousands of opportunities for efficient, dependable men to become electrical contractors. When you are your own boss the money you can make is limited only by your own energy and ability.

PERSONAL INSTRUCTION.

The NEW YORK ELECTRICAL SCHOOL is not a correspondence school. You learn by doing—by personal instruction on full size standard electrical equipment under the personal supervision of trained instructors.

At N. Y. E. S. you train your hands and mind at the same time. You learn the theories of electricity—and then you are shown how to put the theories into actual practice by solving the problems with your own hands.

The man who has learned electricity by actually doing electrical work under intelligent personal instructors can go to any part of the world and be sure of a good living. There are N. Y. E. S. graduates in all the countries of the world.

Write today for the 48-page booklet giving full information about the N. Y. E. S. Course and showing pictures of the equipment available for your personal use in our two seven-story buildings. IT IS ABSOLUTELY FREE TO YOU.

The NEW YORK ELECTRICAL SCHOOL
29 W. 17th St., New York

MAIL TODAY

The New York Electrical School
29 W. 17th Street, New York.

Please send me FREE your 48-page booklet. It is understood that this request puts me under no obligation.

Name .....

Address .....

RAILWAY POSTAL CLERK

$1900 to $2700 a year

Long vacations with pay. Work easy. Travel on fast trains with all expenses paid, including hotel. No worries about the future.
MY FREE BOOK TELLS HOW
Get my big free book about the Civil Service which tells all about the Railway Postal Service, and other positions, and how I can help you. Write today.
PATTERSON SCHOOL
Arthur R. Patterson, Civil Service Expert
9011 Wisner Bldg. Rochester, N. Y.

SQUAB BOOK FREE

Breed squabs and make money. Sold by millions. Write at once for free 40-page book beautifully printed in colors telling how to do it. *You will be surprised.* PLYMOUTH ROCK SQUAB CO.
506 H St., Melrose Highlands, Mass.

Double Your Pay Easy Way

Learn at Home to Make Clever SHOW CARDS

Prepare now. No special ability needed if you learn at home by this amazing, complete and practical method. Student R. A. Hart wrote, while learning, "I make $2.00 an hour in spare time." Ray Underwood wrote, "I clear $25 to $35 a day." Other students make $25 or more a week in spare time while learning — more when they graduate. Good Show Card Writers earn $50, $75 and $100 a week.
Get Free Book. Explains amazing opportunities to make money right in your own neighborhood.
No obligation. No salesman will call. State age and Mr., Miss or Mrs.
WASHINGTON SHOW CARD SCHOOL
1117-15th St., N. W., Dept. 2611-E, Washington, D. C.

BE AN OIL EXPERT!

Trained men needed! Geologists, Drillers, Refiners, (Chemists and Still Men) Oil Salesmen, earn 2 to 10 times more than in other fields. Write today! FREE Booklet! Petroleum Engineering University, Dept. 271, Fort Wayne, Ind.

www.americanradiohistory.com

Come Now to the Nassau at Long Beach L. I.

Just 40 minutes from New York by train

THE BOARDWALK IS GLORIOUS
THE AIR IS LADEN WITH HEALTH
THE HOTEL IS A PLEASANT TREAT

Sea Baths ♪ Music ♪ Dancing
Festive Week-Ends

Room Plus Food ~ Only $8.00 per Day

OPEN ALL YEAR
TELEPHONE - LONG BEACH-100
Henry H. Gerard — Managing Director

CHEMCRAFT
REGISTERED TRADE MARK
THE CHEMICAL OUTFIT

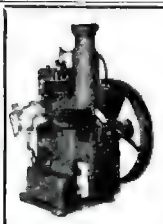
Laboratory Work Bench

Here at last is a real Chemical Lab. Just what every Experimenter has wanted. The Work Bench is 44" long; 20" wide; 47" high; strongly made and nicely finished. Provides running water, a sink, shelves for chemicals and apparatus, and plenty of table space. Equipment consists of 60 chemicals, an assortment of useful apparatus and a Chemical Manual containing 608 experiments with descriptions, instructions and chemical information.

Laboratory Work Bench and Equipment $25.00. Weight, packed for shipment, 45 pounds.

FREE Magazine of the Chemcraft Chemists' Club sent to every one who writes for it now. Full of interesting chemical ideas and experiments. A post card will do—but do it now!

The Porter Chemical Co.
2105 Summit Avenue
Hagerstown Maryland



The Amalgamated Sixty

FINEST SMALL ENGINE MADE

We also handle castings for other Engines, Bearings, Belting, Blue Prints, Books on Mechanical and Scientific Subjects, Brass Castings, Compressors, Gears, Lathes, Motors, Saws, Shafting, and Supplies of every kind for MODEL MAKERS, MECHANICS and HANDY MEN.

Complete Catalogue 25c., which is allowed on first $2 order.

AMALGAMATED SALES & SERVICE CORPORATION
327N South LaSalle St., Chicago, Ill., U. S. A.

If I WERE YOU-

I would start earning big money in a big uncrowded field. I'd go into auto-painting. The opportunity is NOW! I will train you and put you in line *quickly* for a good steady job. Make $50 to $90 a week.

Or a Paint Shop of Your Own

Little or no capital needed. Independence, prosperity will be yours! Let me prove you can have it by my

New Shop-type Method

Actual experience as you learn by working on wood and metal panels furnished with the 13 big working outfits without extra charge. No car needed. Greatest advance in home-training ever made. Send for FREE BOOK, "If I Were You," giving all details. No obligation whatever.

AMERICAN AUTO PAINTING SCHOOL
427 South Ashland Avenue Dept. 204, Chicago, Illinois

$800% PROFIT In One Month

Geo. Larson, McCarrie graduate writes: "We turned out $1100 worth of work in April—a profit of about $800 for two of us. This has been about the average since the first of the year." Learn Mechanical Dentistry and do as Larson did.

We teach you in a few months of individual instruction to make plates, crowns, bridges, etc. for dentists. Day or night schools in Chicago, Philadelphia, Boston, Detroit, Cleveland. No books or classes—work your way thru' school—we help you obtain employment. Write for interesting book on mechanical dentistry.

Free Book

McCarrie School of Mechanical Dentistry
1338 S. Michigan Avenue Dept. 142 Chicago, Ill.

Learn Photography at HOME

Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book, *Opportunities in Modern Photography*, and full particulars.

AMERICAN SCHOOL OF PHOTOGRAPHY
Dept. 1428, 3601 Michigan Ave., Chicago, U. S. A.

BIG NEW CATALOG FOR RADIO BUILDERS FREE

My big 1928 Radio Catalog, Call Book and Trouble Finder. 132 pages about Radio. Chock full of newest circuits—kits, transmitter parts, short wave outfits, eliminators and speakers. Thousands of bargains at lowest wholesale prices. A regular Radio Encyclopedia—Free. Write today.

LATEST RADIO CIRCUITS

American Auto & Radio Mfg. Co.
HARRY SCHWARTZBERG, PRES.
Dept. 275 American Radio Bldg., Kansas City, Mo.

handle section, using glue and brads, or small screws placed on the inside.

The shelf is the next piece to build. There is nothing new to consider in its construction save the small dowels or pegs for the spools. After cutting the curves and fitting the ends of the shelf to the posts, before attaching, bore the two $\frac{3}{8}$" holes for the wooden pins. To make the dowels, take a piece of straight grained wood about twelve inches long and $\frac{1}{4}$" square. Hold one end in one hand and with a plane smooth off the corners on as much of the piece as possible, turning the stick as it is being planed. Now, holding to the rounded end, plane the opposite end in a similar manner. This will make the whole stick approximately round. To finish the job, bore a $\frac{3}{8}$" hole in a piece of hard wood and drive the dowel through it. This will produce a perfectly round piece for the spool holder pegs. Cut off to desired length and glue in place.

Place the shelf into position and nail. After a final sanding we are ready to finish Either enamel or lacquer is recommended, although stain and varnish would give excellent results if carefully applied. A few "Decalcomania" transfer designs as a final touch will set off the large spaces and make of your sewing "Carry-all" a thing of beauty and joy forever.

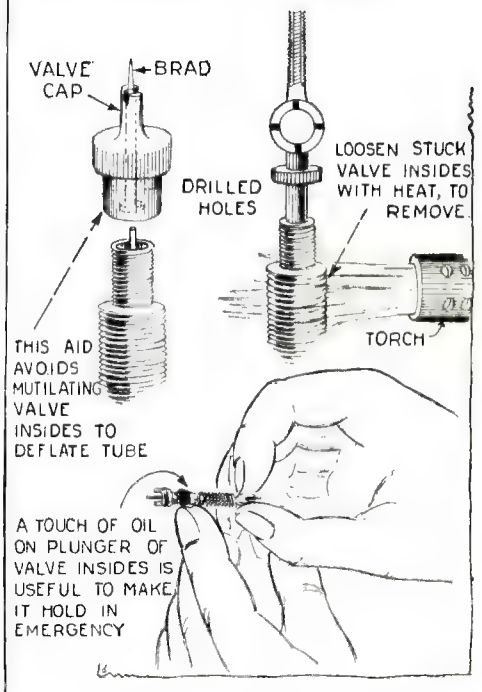
Motor Hints

By GEORGE A. LUERS

(*Continued from page* 612)

4. The compression should be tested by the hand crank, and if found low in one or more cylinders, the valves should be ground.

5. Wheels should be adjusted to track true, so there is true rolling, without resistance that wheels out of line cause.


VALVE CAP
BRAD
DRILLED HOLES
LOOSEN STUCK VALVE INSIDES WITH HEAT, TO REMOVE
TORCH
THIS AID AVOIDS MUTILATING VALVE INSIDES TO DEFLATE TUBE
A TOUCH OF OIL ON PLUNGER OF VALVE INSIDES IS USEFUL TO MAKE IT HOLD IN EMERGENCY

How to care for the tire valves.

6. The wheels should be tested for binding while turning, especially binding due to brake bands that are tight or not true with drums.

7. Tires should be inflated several pounds in excess of the specified pressure, as heavier loading due to baggage requires this. Inspect and inflate twice weekly when touring.

8. Car should be driven well within speed limits, preferably not over thirty miles an

www.americanradiohistory.com

hour. Do not allow engine to idle, while making short stops and a practice should be made of shutting off the engine before bringing the car to a stop.

9. The engine should be operated with the spark lever advanced as far as possible, without causing knocking. The carburetor choke should be kept in normal position at all times, except as required for starting the engine. Much gasoline is often wasted by finding that the car has been driven many miles with the choke partly out; avoid this.

CARE OF TIRE VALVES AND RENEWAL OF STUCK INSIDES

Some forty or fifty times each year the tire valve is used when inflating. The valve is unfailing in most of these instances; however they occasionally leak and the tire goes flat. To insure against leakage, the cap should be used over the valve, so as to prevent particles of sand and dirt entering and being forced in with the air. Care should be used to press the air hose right down and not bend the small projecting valve stem, which will make the valve insides stick and fail to hold.

Avoid unscrewing the valve insides, as this tends to destroy the rubber gasket. If the air must be released, make up a valve cap, for releasing, as shown in the sketch. This is made by driving a brad in the cap, after having drilled a cross hole to allow air to escape. In some cases a leaking valve must be used, under which condition a small amount of oil can be put on the plunger with the tip of the fingers.

When a valve inside cannot be removed, use a torch or very hot soldering bit around the top to loosen the stuck rubber. This allows it to be unscrewed, for renewal.

A Perpetual Motion Hoax

(Concluded from page 573 of October issue.)

WE DEFY MR. HAMILTON

June 29th, 1927.

Mr. John S. Hamilton,
Herald Square Hotel,
116 W. 34th St.,
New York City.
Dear Mr. Hamilton:

Your favor of the 28th duly to hand, and there is no use going into further correspondence. You are either deluded or else you are working under a misapprehension. Whichever it is makes no difference to us. The point is that you have not complied with our conditions and, as a matter of fact, the whole thing is a huge joke.

The arrangement which you have is an old trick, well known to every electrical engineer.

The whole sum and substance, however, is that you have no output, and your meters were not connected on the output side at all.

If you think you will get any further through the law, and if you want to spend some good money, you are at liberty to do so. In the meanwhile we are going to publish the whole proceedings in Science and Invention, in one of our forthcoming issues.

Any further letters from you on this subject will remain unanswered, and you had better take up the matter with your attorney at once.

Sincerely yours,
Science and Invention,
(Signed) H. Gernsback,
Editor.

H. Gernsback,
HMK.

MR. HAMILTON RE-CONSIDERS

5806 Locust St.,
Kansas City, Mo.
July 12th, 1927.

Mr. H. Gernsback,
Editor, Science and Invention,
230 Fifth Avenue,
New York City.
My dear Sir:

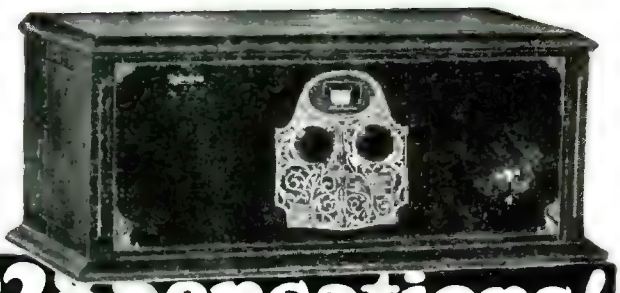
Since receiving your letter of the 29th ultimo, I have given your side of the question considerable study, and find that you are justified in holding your ground in so far as support goes.

In Foster's Handbook, on page 388 and 389, under "Electrical method of supplying losses," you will find a very clear presentation of your side of the argument. It is much more clear than Pender's description of the "Hopkinson Test."

(*Continued on page 659*)

30 Days FREE TRIAL 5 Year Guarantee

MARWOOD



The 1928 Sensations! 8 Tube-1 Control

ALL ELECTRIC or Battery Operation

AGAIN Marwood is a year ahead—with the Radio sensation of 1928—at a low price that smashes Radio profiteering—the marvelous 8-Tube Single Control Marwood for BATTERY or ALL ELECTRIC operation. Direct from the factory for only $69.00 retail price—a price far below that of smaller, less powerful Radios. Big discount to Agents from this price. To prove Marwood can't be beat we let you use it on 30 Days Free Trial. Compare it with any Radio at any price. If you don't say it is a wonder, return it. We take the risk.

Only $69 RETAIL PRICE
Big Discount to Agents From This Price

ALL ELECTRIC 8 Tube 1 Control $98 RETAIL PRICE

Big Discount to Agents From this Price

Has Complete A-B Power Unit

A REAL ALL ELECTRIC Radio with one of the best A B Power Units on the market—at the world's lowest price. No batteries needed. If you have electricity in your home, just plug into the light socket and forget batteries. Costs less than 2c a day to operate. Always have 100% volume. ALL ELECTRIC Radios are high priced, but we cut profit to the bone and offer a $250.00 outfit for $98.00 retail price. Big discount to Agents from this price.

New Features

Coast to coast with enough volume to fill a theatre. Amazing distance that only super-power Radios like the Marwood 8 can get. Ultra-selectivity to cut out interference. Every Marwood is perfectly BALANCED—a real laboratory job. One dial control gets the stations with ease. A beautiful, guaranteed, super-efficient Radio in handsome walnut cabinets and consoles.

Buy From Factory —Save Over Half

Why pay profits to several middlemen? A Marwood in any retail store would cost practically three times our low direct-from-the-factory price. Our policy is highest quality plus small profit and enormous sales. You get the benefit. Marwood is a pioneer, responsible Radio. If you want next year's improvements NOW—get a Marwood.

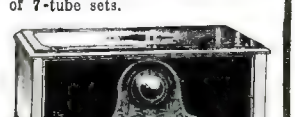
$47 RETAIL PRICE Big Discount to Agents from this Price

Get Our Discounts

before you buy a Radio. Save half. Try any Marwood on 30 Days Free Trial. Compare it with any Radio regardless of price. If you don't get the surprise of your life, return it. We take the risk. Don't let Marwood low prices lead you to believe Marwood is not the highest quality. Guaranteed 5 years.

6 Tube - 1 Control

for BATTERY or ALL ELECTRIC operation. Get coast to coast on loud speaker with great volume. Only $47.00 retail price. Big discount to Agents from this price. Comes in handsome walnut cabinets and consoles. Has the volume of 7-tube sets.



Rush for Free Trial

Marwood Radio Corporation,
5315 Ravenswood Ave.,
Dept. A-14, Chicago.

Send Agents' Confidential Prices, 30 Days Free Trial, New Catalog and Agents' New Money Making Plan. No obligations on my part.

Name .....
Address .....
St. or R.F.D. .....
City ..... State.....

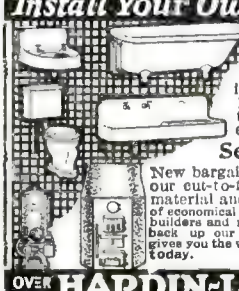
AGENTS GET YOUR RADIO AT WHOLESALE PRICE

Make Big Money in Spare Time

It's easy to get orders for the Marwood. We want agents and dealers in each territory to handle the enormous business created by our national advertising. Make $100 a week or more in spare time demonstrating at home. No experience or capital needed. We show you how. This is the biggest season in Radio history. Rush coupon for 30 Days Free Trial, 1928 Catalog, Agents' Confidential Prices and Agents' New Plan.

MARWOOD RADIO CORP.
5315 Ravenswood Ave., Dept. A-14, Chicago

PLUMBING-HEATING
Install Your Own—Save Half



Lowest wholesale prices on highest quality Grade A goods. Any Handy Man can install his own Plumbing and Heating BY OUR NEW EASY METHOD. Get the best and pay only a little each month.

Send for FREE Book.

New bargain catalog just issued. With our cut-to-fit systems you save waste material and high labor cost. 50 years of economical service to home owners, farmers, builders and mechanics. Million Dollar Plants back up our Bonded Guarantee. FREE book gives you the whole story. Write for your copy today.

OVER 50 YRS. HARDIN-LAVIN CO. EST. 1876
104-14 West Pershing Rd., Chicago, Ill.

Magnified 225 Diameters

This is what the tip of a fly's leg is like when seen through the

ULTRALENS MICROSCOPE

$7.50 for Complete Outfit Prepaid

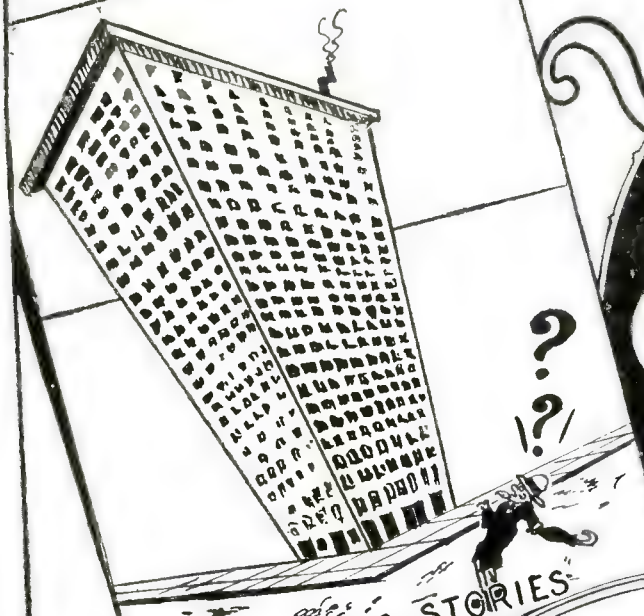
At last a high powered microscope is within the means of all who wish to study, observe and experiment with the vast world of minute objects invisible to the naked eye. Such fun it is, as well as educational. No technical training required, yet hundreds of scientists and teachers are using this instrument. Gives enormous magnification and perfect definition. Send $7.50 for complete outfit. Send for descriptive literature.

Scientific Apparatus Corp., Dept. 203, Milton, Pennsylvania

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 230 Fifth Avenue, N. Y. C.

www.americanradiohistory.com

What is a COOKOO NUT?



"AMAZING STORIES"

A COOKOO NUT is a new wrinkle to pass away your time. Far more interesting, more entertaining and more humorous than a cross-word puzzle. The COOKOO NUT illustrates an ordinary, well-known saying in a distinctly new manner. Study the examples on this page. The test of a COOKOO NUT is that there must be no question as to the correctness of the description. The quotation must absolutely fit the COOKOO NUT, otherwise it does not go. Cover up the captions of the COOKOO NUTS on this page, and make your friends guess what each COOKOO NUT stands for. An exciting new game is to play COOKOO NUTS at parties where everyone is asked to make up an original COOKOO NUT. The most mirth-provoking one gets the party prize.

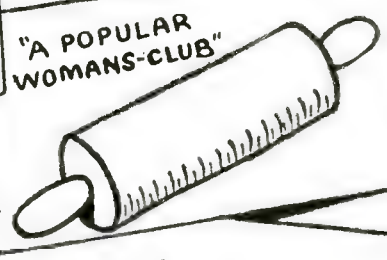
The best COOKOO NUT printed in FRENCH HUMOR gets a weekly prize of $5.00. For every other one accepted FRENCH HUMOR pays $1.00.

"DESIRE UNDER THE ELMS"

"A SOCK IN THE EYE"

"SWEETIES"

"A POPULAR WOMANS-CLUB"



"PERIOD FURNITURE"

"A HOLE IN ONE" 1

"CORN BEEF AND CABBAGE"

See

FRENCH HUMOR

France, that magic land of humor, wit, and keen, Knife-edged "parlay," offers humor-loving Americans, its choicest, finest humor through the new weekly magazine, "FRENCH HUMOR." Your first copy of "FRENCH HUMOR" will prove what we say—hundreds of choice jokes and *original illustrations by French Artists*, with all the illustrated jokes printed first in French and then in English. It's the funniest, wittiest and most entertaining magazine you have ever read.

10c WEEKLY ON ALL NEWSSTANDS

www.americanradiohistory.com

A Perpetual Motion Hoax

(*Continued from page 657*)

To sum up what both say, they vary from the ordinary definition of "efficiency" as being the output divided by the input.

They say, in the case of pumping back, that the efficiency is output divided by input, plus output.

In the case of the machine tested by the Electrical Testing Laboratory, the input from the line was 936 watts, while the output of the generator was 1296.45 watts.

Ordinarily, the efficiency would be 1296.45 divided by 936, or 138 per cent.

The books figure it as 1296.45 divided by 936 PLUS 1296.45, or 58 per cent.

In my opinion, their eyes were blinded by the "Law of Conservation of Energy," written by JOULE in 1847, and endorsed by LORD KELVIN.

They failed to see that the 1296.45 watts was produced by the 936 watts.

In the machine, there was an exchange of energy, due to the mechanical connection between the three machines, which furnished the REASON for the difference between 936 and 1296.45.

It cannot be denied that 936 watts was all the energy taken from the line, because the meters showed it.

It cannot be denied an energy was produced in a neighboring electric circuit, which the meters say was 1296.45 watts.

If I agreed to show you a greater amount of water than was handed to me by the Laboratory, surely you would have said I had fulfilled my agreement if a careful measurement of the quantity I returned to the Laboratory was greater than the measured quantity handed to me originally.

It is feared that you attach too much importance to expert opinion.

Let Chauncey Depew testify. "Every time I consulted an expert, I have lost money. At one time I was offered a quarter interest in the Bell Telephone. I consulted the experts who told me that commercially it was a fake and mechanically a toy. Had I followed my strong faith instead of their expert opinion, I would be worth one hundred million dollars today. THE REASON IS, they lack imagination, and refuse to accept anything that conflicts with their data."

The falling apple was an old story, known to every passer-by, yet Newton saw in it the Law of Gravity.

What I see in the case of my machine, is a true case of securing a larger amount of actually measured electrical energy from a smaller source.

All the "yes-men" will hang together and swear that I am wrong.

Scientific history is full of instances where the "yes-men" were finally whipped.

Do you remember the old lady that asked Barnum, of circus fame, if he wanted to buy a cherry-colored cat?

She was so innocent looking, that he suspected nothing and told her he would give $75 for it.

The next day, when he opened the basket she brought in, out leaped a black cat.

He laughed, but paid the money with the remark that, "Some cherries are black."

He could have backed out with the statement that black cats were "old-stuff," and all that, but he was a sport.

I thought you wanted a bona fide case with meters to back you up.

Pender's Handbook, on page 2184, gives the power of a generator, as power at terminals, expressed in watts.

I fear that some day it will be said of SCIENCE AND INVENTION that Truth in all her ravishing beauty stood naked in its office, and was not even noticed; much less embraced.

It is a long road that has no turning, so we shall wait.

I have not much money, but I place it on myself.

Wishing you well, I am

Yours respectfully,

(Signed) JOHN S. HAMILTON.

P.S. I furnished the machine that came up to test, but I failed to furnish the intelligence to understand it fully. Truly, a sad case.

In November "Radio News"

The Theory of the Peridyne Receiver—By Hugo Gernsback.

The Hilograd Receiver—By F. A. Jewell.

The Cause and Elimination of Fading—By D. H. Menzel.

Wanted—Radio Applause—By E. Sowers.

Changes Due to Shielding—By H. A. Zahl.

Photoelectricity and Television—By J. P. Arnold.

Starting with this issue RADIO NEWS each month will publish a section devoted exclusively to the broadcast listener. In it will be beautiful full-page pictures of the leading broadcast artists, articles of interest to the broadcast fan, and other special features.

Radio Cabinet and Bench

$1.00 down

Only $1.00 with coupon below brings this handsome, massive, pure Period design, consolette radio cabinet, with bench to match, to your home on 30 days **Free Trial!** Just the thing you need to give your radio the appearance of a costly set and to beautify the room with a touch of elegance. Keeps all unsightly accessories out of sight. Made of well seasoned, selected hardwood in **Handsome Walnut Finish.** Two large, French style swinging doors with ornamental brass knobs. Front panels of doors in carved effects. Edge of top neatly bevelled. Cabinet has lower cross brace to insure rigidity. Top is 33¾ x 18 inches, height inside 11½ inches. Full height 33 inches. Bench is 18 inches high.

$1.50 a Month

After 30 days trial if not satisfied, send Cabinet and bench back at our expense and we will refund your $1.00 plus all transportation charges you paid. Or keep them and pay only $1.50 a month till you've paid our smashed cut price—only **$14.95.** Our credit price beats cash prices anywhere. **Order by No. B182A.** Shipping weight about 70 lbs.

Send coupon now!

Straus & Schram
Dept. R3798 Chicago, Ill.

Straus & Schram, Dept. R3798 Chicago

Enclosed find $1. Ship Walnut Finish Radio Cabinet and Bench. I am to have 30 days free trial. If I keep the cabinet and bench I will pay you $1.50 monthly. If not satisfied, I am to return them at your expense and you are to **refund my money** and any freight or express charges I paid.

Radio Cabinet and Bench No. B182A, $14.95

*Name*_____

*Street, R.F.D. or Box No.*_____

*Shipping Point*_____

*Post Office*_____ *State*_____

*Married or Single*_____ *Nationality or Color*_____

If you want only our free catalog of home furnishings, mark X here ☐

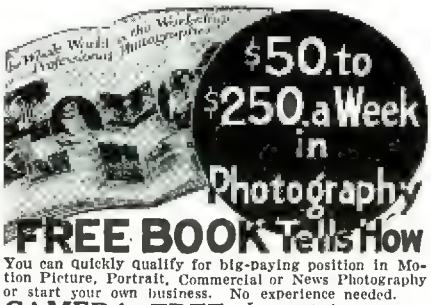
Man! How Easy

JUST a short period of pleasureable practice and you play pieces on the new Conn saxophone. 1927 models embody many new and exclusive features—easy playing, wonderful tone, perfect intonation, dependable mechanism.

FREE TRIAL; EASY Payments on any Conn instrument for band or orchestra. Send now for free literature and the details.

C. G. CONN, *Ltd.*
1156 Conn Bldg. Elkhart, Ind.

CONN BAND INSTRUMENTS



FREE BOOK Tells How

You can quickly qualify for big-paying position in Motion Picture, Portrait, Commercial or News Photography or start your own business. No experience needed.

CAMERA FREE Learn at home or in our great New York Studios. Easy to learn. Write today for Free Book, Job Chart and Free Camera offer.

NEW YORK INSTITUTE OF PHOTOGRAPHY
Dept. 82 10 West 33rd St. New York

$150 to $300 monthly profits EASILY with ONE DAY Battery Charging

Thousands of HB users are making big profits every month. Every car owner and radio owner wants quick, reliable One Day Charging. Get their business with an HB One Day Battery Charger. Small cash payment brings you complete outfit on 30 days' trial with money back guarantee. Only $16.50 monthly pays for your HB, easily made many times over by your increased battery charging business. Get an HB now. Start making $150 to $300 clear monthly profits. Write for free bulletin 326.

HOBART BROS. CO. Box S117 TROY, OHIO

MORE HB than BATTERY CHARGERS of ALL OTHER MAKE

www.americanradiohistory.com

The only man who could talk to the Superintendent

"SOON after I began studying," a student wrote to us the other day, "we had a change in management at our plant. I certainly was glad then that I had decided to study in my spare time. For, thanks to my I. C. S. course, I was the only man in the organization who could talk to the Superintendent in his own language. As a result, I was promoted over men who had been here from ten to twenty years. My salary has been increased 90 per cent in the last ten months."

THAT'S a true story of what just one I. C. S. student has done. There are thousands of others. Every mail brings letters from men and women telling of promotions and increases in salary due directly to spare-time study.

One hour a day, spent with the I. C. S. in the quiet of your own home, will prepare you for success in the work you like best. *Yes, it will!* Put it up to us to prove it.

Mail this Coupon To-day

INTERNATIONAL CORRESPONDENCE SCHOOLS
"The Universal University"
Box 6208-E, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X:

BUSINESS TRAINING COURSES

☐ Business Management	☐ Salesmanship
☐ Industrial Management	☐ Advertising
☐ Personnel Organization	☐ Better Letters
☐ Traffic Management	☐ Show Card Lettering
☐ Business Law	☐ Stenography and Typing
☐ Banking and Finance	☐ English
Management	☐ Civil Service
☐ Accountancy (including C.P.A.)	☐ Railway Mail Clerk
☐ Cost Accounting	☐ Common School Subjects
☐ Bookkeeping	☐ High School Subjects
☐ Private Secretary	☐ Illustrating
☐ Spanish ☐ French	☐ Cartooning

TECHNICAL AND INDUSTRIAL COURSES

☐ Electrical Engineer	☐ Architect
☐ Electric Lighting	☐ Architects' Blueprints
☐ Mechanical Engineer	☐ Contractor and Builder
☐ Mechanical Draftsman	☐ Architectural Draftsman
☐ Machine Shop Practice	☐ Concrete Builder
☐ Railroad Positions	☐ Structural Engineer
☐ Gas Engine Operating	☐ Chemistry ☐ Pharmacy
☐ Civil Engineer	☐ Automobile Work
☐ Surveying and Mapping	☐ Airplane Engines
☐ Metallurgy ☐ Mining	☐ Agriculture and Poultry
☐ Steam Engineering ☐ Radio	☐ Mathematics

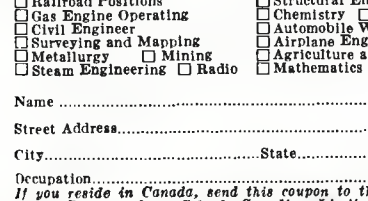
Name .....

Street Address .....

City ..... State .....

Occupation .....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal



Helps You Win CONTESTS!
Cuts Wood & Iron

The F.P.M. saw cuts wood, iron and bakelite at any angle. Used and recommended by experts in every line. Unequalled for sturdy, lasting construction and fine workmanship. Blades of finest tempered steel. Get the F.P.M. Saw at any hardware store or order direct. Send for circular.

1 F.P.M. Saw and 7 Blades sent prepaid $1.00

DEALERS Write for Discounts JOBBERS

F.P.MAXSON, 3722 N. Ashland Ave. Chicago

Insure your copy reaching you each month. Subscribe to SCIENCE AND INVENTION—$2.50 a year. Experimenter Publishing Co., Inc., 230 Fifth Avenue, New York City.

New Single Sleeve Auto Engine

(*Continued from page* 603)

trated, and while automobile buyers are always somewhat adverse to purchasing a brand new type of engine, still when they are shown what the engine can do; and in view of the excellent reputation enjoyed by the dual sleeve Knight engine, which has been on the American market quite a few years, it would seem that this new single sleeve and greatly simplified automobile engine will make many friends.

Instead of the usual timing shaft with its cams which open and close the valves through the medium of push rods and rollers, the timing shaft in the new single sleeve engine carries a series of worm gears. The spiral worm opposite each cylinder meshes with a spiral worm gear, which is attached to a cam as shown in the drawings. As this cam revolves, it naturally raises and lowers the sleeve in an oscillating fashion. It took some clever engineering indeed to develop the proper shape of the ports in the oscillating sleeve and those in the cylinder walls.

Considering a single cylinder for a moment in this new single sleeve engine, it becomes evident that the piston slides up and down inside the iron sleeve, while the sleeve in turn oscillates up and down between the piston and cylinder wall. As the drawings will help to make clear, and for the particular design of the engine here illustrated, the two intake ports are opposite one another; while the two exhaust ports are also opposite one another, when they are open. These engines may be built with five ports instead of four, and other variations of the number of ports and their placement may be employed, as pointed out by one of the engineers connected with the company who have brought out this newest development in the automotive field. Special lubrication features had to be developed in order to properly lubricate the iron sleeve over its full length. It is very interesting to make a model of this new single sleeve engine cylinder out of cardboard, and in this way you will perceive what a clever piece of engineering this design really amounts to.

MECHANICAL FEATURES

Referring to the cross sectional view, it will be seen that the crankshaft, connecting rod, and piston are of conventional design and not necessarily different from those used in a poppet valve type of engine. The essential difference lies in the substituting of a single valve of cylindrical form in place of the usual poppet valves.

The cylinder is open ended and has port openings cut on its circumference immediately below the bottom edge of the cylinder head or stationary piston. Intake and exhaust ports are on opposite sides of the cylinder block so that separate manifolds are employed.

The water jacket surrounding cylinders is free from pockets and tortuous passages, and provides inspection access to water cores between the exhaust port passages through openings on top face of cylinder. A water header casting encloses the top of water jacket, the necessary water joint being made by securing header to cylinder by means of ring nuts on cylinder head. Over the water header is placed a stamped cover which acts as an ignition wire carrier and serves to enhance the appearance of engine.

The tubular sleeve valve is interposed between the cylinder and the piston, and has ports cut at its upper end to register with those in the cylinder wall.

The valve shaft, equivalent to the camshaft in a poppet valve engine, is located below the sleeves and at one side, its axis lying

Oh Boy! See All!
Big 3½ Ft. Telescope

Lend wings to your eyes! People and objects miles away seem close. Wonder telescope brings new pleasures to home, farm, camp, travel, sport. Study the mysterious Sun spots; see Moon and Stars as never before. See people on the beach, on the mountains, etc.

FREE Yes, absolutely free! A handsome leatherette Carrying Case and Shoulder Strap. Also Solar Eye Piece to view the Sun—a special feature—found only on expensive instruments.

5 Sections
8 Power Lenses
Brass bound; measures 12 in. closed; powerful achromatic lenses protected by dust caps.

Thousands Pleased
H. Brush wrote: "Watched submarines three miles off coast." Ed. Foster: "Tell time on clock five miles away." C. Scribner: "See lighthouse 18 miles away." Mrs. Yarbrough: "Could tell color of aeroplane four miles away." S. M. Gearheart: "Can see men working seven miles away." A. R. Walker: "Would not take $10 for it."

CLIP THIS AD

On the Beach · Solar Eye Piece · Travel and Sport · Study the Heavens · At the Races

SEND NO MONEY

On delivery of Telescope, free Case and Eye Piece pay Postman only $1.85, plus postage. (2 complete outfits $3.50.) Satisfaction guaranteed or money refunded. Send today, entertain your friends!

FERRY & CO., Dept. Chicago

EARN $10 to $20 per day

The Best Pay Trades

Paperhanging - Decorating - Sign Painting - Show Card Writing - Graining & Marbeling - Auto Painting - Furniture Decorating.

Learn in a few weeks in the best equipped school in America.

CATALOG FREE

CHICAGO PAINTING SCHOOL
132 WEST AUSTIN AVE., CHICAGO, ILL.

6 TUBE RADIO
ONE DIAL
Only $32.50

Latest advanced circuit. All steel chassis totally shielded. Balanced parts of best quality. Marvelous power and selectivity. Gets the long range stations as clear as a bell. One dial single control. An unsurpassed value—just one of our many mighty bargains.

FREE Log and Call Book and Big New Catalog—just off the press. Full of Radio Bargains. Send for your free copy now!

American Auto & Radio Mfg. Co.
HARRY SCHWARTZBERG, Pres.
Dept. 272 American Radio Bldg., Kansas City, Mo.

AMERICAN RADIO BARGAINS

FREE
Fine Tone
$20 Musical Instruments

Your choice of a Violin, Tenor Banjo, Hawaiian Guitar, Banjo, Cornet, Ukulele, Banjo Ukulele, Guitar, Mandolin or Banjo Mandolin. You will be proud to own any one of these instruments and we will give you one without cost. A few cents a day for lessons is your only expense. Our system of teaching is so easy that you can play several pieces by note with the first four lessons. We guarantee success or no charge. Instrument and lessons sent on one week's free trial. Write for booklet today, no obligation. Over 200,000 satisfied pupils.

CHICAGO CORRESPONDENCE SCHOOL OF MUSIC, INC.
1632 North Halsted Street, Dept. 370, Chicago, Illinois

LEARN TO DRAW!

Remarkable book—"COMMERCIAL ART AND CARTOONING." Explains how to make illustrations for books, advertisements, etc. Also how to become a Cartoonist. NO CORRESPONDENCE COURSE—Book tells all—14 chapters—125 illustrations. Explains Elementary Drawing; Still Life; Pen, Ink, Charcoal and Crayon Work; Cartooning, etc. Bound Flexible, Im. Leather. Postpaid for $2.00 (C.O.D. 17c extra). OGILVIE PUB. CO., 57 Rose Street, New York, Dept. 139

COMMERCIAL ART AND CARTOONING

THIS CLASS PIN 30c.

12 or more, Silver plate, Single pins 40c ea. choice 2 colors enamel, 3 letters, date. Sterling Silver, 12 or more 50c ea. Single pins 60c. ea. Free Cat. shows Pins, Rings, Emblems 25c to $8 ea.

685 METAL ARTS CO., Inc., 773 Portland Ave., Rochester, N.Y.

www.americanradiohistory.com

parallel to that of the crankshaft. It is driven at engine speed by chain or gear train from the crankshaft, and has a worm gear situated at the center line of each cylinder.

At the foot of each cylinder, at right angles to the axis of the crankshaft, and immediately above the valveshaft, lies the sleeveshaft, consisting of a single cranked shaft and worm wheel mounted on suitable bearings within the crankcase. The worm wheel meshes with the valveshaft worm gear, and rotates at a ratio of one to two or half engine speed.

A universal coupling or ball and socket connection is placed within a housing provided at the foot of the sleeve valve, the socket being fixed to the sleeve, while the sphere zone is free to rotate and slide on the sleeve shaft crank pin which engages in the bore of this member.

Rotation of the sleeve shaft imparts to the sleeve a partly rotating and partly reciprocating movement. *Any point on the sleeve surface travels in a closed curved path elliptic in shape.* The path of travel of the sleeve shaft crank and universal coupling at point of actuation is circular, but when projected on to the sleeve wall it becomes elliptic owing to the radius of the sleeve surface being less than the distance from axis of cylinder to point of actuation, and the fact that the sleeve oscillates around the cylinder axis.

SLEEVE DRIVING MECHANISM

The design of mechanism for actuating the sleeve is an interesting problem and many schemes have been tried out from time to time; however, all things considered, the gear type of drive in various forms has proven the most satisfactory.

THE SLEEVE VALVE

The characteristic twisting movement of the sleeve has many inherent advantages; although primarily conceived for the purpose of obtaining the proper sequence of valve operation when using one sleeve instead of two, it subsequently proved a decided benefit in other respects. It is a natural lubricating motion, the oil being rolled evenly over the entire sleeve surface, and not localized and sheared, as in the case of a sleeve or piston having a reciprocating movement only.

Oil grooves are not necessary on the surface of a single sleeve valve.

The movement of sleeve approaches harmonic motion, and does not call for the sudden reversal of direction as does a sleeve with pure reciprocating movement.

Again, the twist dissipates the heat loss to the sleeve wall over a larger area, giving more even temperatures, therefore reducing distortion to a minimum. During compression and power strokes, when the sleeve is subjected to the greatest pressure, it is moving with the piston, and the sleeve ports are protected between the water cooled surfaces of cylinder and cylinder head.

It has not been found necessary to fit a sealing ring to the cylinder head, as used in the double sleeve valve engine. This is no doubt due to the baffle effect caused by the twisting movement which smooths out minute surface irregularities, coupled with the fact that there is a sealing surface at both sides of the sleeve wall during compression.

The fact that piston and sleeve move in the same direction at different speeds during pressure strokes results in a considerable reduction in piston rubbing speed compared to that of a conventional poppet valve engine, and so reduces piston wear. The wear of the sleeve surface is practically negligible. It will be noticed that the sleeve-shaft crank is near the 90° position at the time of intake closing and exhaust opening, so that the sleeve is moving with maximum velocity and practically in a vertical direction, therefore giving the desirable quick

(*Continued on page 663*)

All Electric or Battery Set! Yes! Big Discounts to User-Agents

America's big, old, reliable Radio Corporation (8th successful year) guarantees in its big, powerful, latest 6, 7 and 8 tube Miraco sets "the finest, most enjoyable performance obtainable in high grade radios." Unless 30 days' use in your home fully satisfies you a Miraco is unbeatable at any price for beautiful, clear cathedral tone, razor-edge selectivity, powerful distance reception, easy operation, etc.—don't buy it! Your verdict final. Save or make lots of money on sets and equipment—write for testimony of nearby users and Amazing Special Factory Offer.

Miraco's work equally fine on "AC" electric house current or with batteries. Take your choice. Many thousands of Miraco users—who bought after thorough comparisons — enjoy programs Coast to Coast, Canada to Mexico, loud and clear—with the magnificent cathedral tone quality of costliest sets. Don't confuse Miraco's with cheap, "squawky" radios. Miraco's have finest parts, latest approved shielding, metal chassis, etc.—as used in many $200 sets.

DEAL DIRECT WITH BIG FACTORY

Your Miraco reaches you completely assembled, rigidly tested, fully guaranteed. Easy to connect and operate. 30 days trial free. 3 year guarantee if you buy. You take no risk, you insure satisfaction, you enjoy rock-bottom money-saving prices by dealing direct with one of radio's oldest, most successful builders of fine sets. 8th successful year.

MIRACO "Powerplus" sets—8 and 7 tube models—have magnificently beautiful, clear cathedral tone quality. Turn one dial for stations everywhere. Ultra-selective. Latest all-metal shielded chassis. Illuminated dial. Fully guaranteed. Try one free for 30 days! Big selection of beautiful cabinets.

7 tube one dial METAL SHIELDED CHASSIS $49.75 RETAIL LIST

Dealers Write! Make big profits showing Miraco to friends. Get Our Special, Wholesale Prices!

USER-AGENTS! MID-WEST RADIO CORPORATION, Cincinnati, O.

BEAUTIFULLY ILLUSTRATED CATALOG Free! AND AMAZING SPECIAL OFFER

SEND NO MONEY—30 DAYS' TRIAL, Special Wholesale Price Offer to User-Agents, Bank References, testimony of nearby Miraco users—*all the proof you want*—sent with catalog.

mail coupon right now!

Electrify Any Radio with MIDWEST NO-BATTERY AC Light Socket Power Units

"A" "B" and "C" power, direct from light socket, without batteries! Write for Midwest prices and discounts. Units are highest grade—lastingly dependable, quiet in operation, fully guaranteed. Mail coupon!

ANOTHER BIG BARGAIN! Famous powerful big Miraco Super 6, 1928 model—ultra selective! Thousands find it outperforms sets of much higher price. 30 Days' Trial Free. Fully Guaranteed.

6 tube Super 36.75 RETAILS

MIDWEST RADIO CORP'N
Pioneer Builders of Sets
409-C Miraco Bldg., Cincinnati, Ohio.

THIS COUPON IS NOT AN ORDER

WITHOUT OBLIGATION, send me free literature, AMAZING SPECIAL WHOLESALE PRICE OFFER, testimony of nearby users, etc.

NAME

ADDRESS

New Invention SPORS Fountain Pen. 60 Day Trial. Money back if not pleased

SAMPLE AGENTS 65c SELLS FOR $1.25. Writes Like a $7 Pen. Many Make $10 Daily Easily

Comes in Red or Green

GUARANTEED 2 YEARS

Improved Point

Newest Invention. Rubber sponge keeps point moist. Writes the instant it touches paper

MAKES $8.40 in TEN MINUTES

I sold my dozen pens in about 10 minutes. Will order another dozen soon. TRACY KRENZ, Nebraska.

Write for FREE Wholesale Specialty Catalog

F. SPORS CO., 827 Agate St., Lesueur Center, Minn.

10 year guar. Watch with chain and ring, large Eastman Roll Film Camera or 22 cal. Hamilton Rifle, yours for introducing finest assorted liquid perfume at 15c a bottle. Send for 20 bottles and choose gift as per offer in our catalog. *We trust you*—just write to BELL PERFUME CO., Dep. B943, Chicago, Ill.

BOUND VOLUMES *at* GREAT SACRIFICE

12 full issues of back magazines, handsomely bound in stiff cloth cover, tremendously valuable for reference and other uses, for sale at great pric reductions to make room. Price $2.50—Worth $10.

SCIENCE AND INVENTION—May 1925 to April 1926
THE EXPERIMENTER—November 1924 to October 1925

Other volumes advertised elsewhere in this issue.

EXPERIMENTER PUBLISHING CO., INC.
230 Fifth Avenue New York, N. Y.

www.americanradiohistory.com

$1 ONLY FOR 8 EIGHT

BRILLIANT NOVELS in Book Form

Your Choice of Eighteen Popular Titles

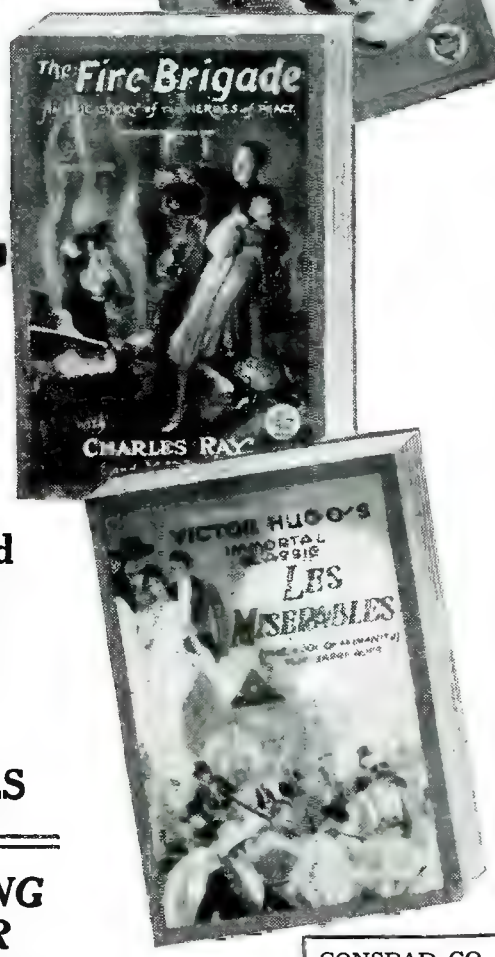
SENSATIONAL BOOK OFFER

EACH story or novel complete in a 144 page 5½x8 book set in large, readable type and profusely illustrated with scenes from the film. Greatest book value ever.

If you have seen the pictures, the fast moving, brilliantly written stories will thrill you. If you read the books first, you will find greater pleasure still in seeing the characters live for you with your favorite stars. Here are many delightful reading hours for $1.00, for these are not tiny booklets, but large, readable, library volumes.

Below are given 18 titles of which you may choose any 8. Clip the coupon below and enclose $1.00, mentioning the books you desire, and we will send them to you at once postpaid.

This is the most sensational book offer this season. It may never again be repeated. We expect thousands of requests for these books. Place your order now to insure prompt delivery.



True Thrilling Novels and Wondrous Romances of the MOTION PICTURES

HERE ARE THE TITLES:

1. New York
2. Campus Flirt
3. Almost a Lady
4. The Love Thief
5. Les Miserables
6. That's My Baby
7. The Dixie Flyer
8. The New Klondike
9. Forbidden Waters
10. Sensation Seekers
11. The Rambling Ranger
12. Don't Tell the Wife
13. The Road to Mandalay
14. Tracked by the Police
15. Tell It to the Marines
16. What Happened to Jones
17. The King of the Jungle
18. The Cat and the Canary

Place Your Order While the Supply Lasts.

AMAZING OFFER

Send your Order in now. Order Books by number.

CONSRAD CO., INC.
230 Fifth Avenue
NEW YORK, N. Y.

CONSRAD CO., INC.,
230 Fifth Ave., New York, N. Y.
Gentlemen: I enclose $1 for books Number.....
Name .....
Address .....
City..... State .....

www.americanradiohistory.com

New Single Sleeve Auto Engine

(*Continued from page 661*)

opening and closing of valve ports. The motion is a friction reducing one and may be likened to the action of the replacing of a cork in a bottle.

Sleeves are usually made of cylinder cast iron, cast in a rotating mould, although ordinary sand castings are entirely satisfactory if carefully made. The wall thickness of sleeve is really governed by what the machine shop can handle without fear of breakage. This will be found ample for strength under working conditions. In practice the wall thickness ranges from 5/64″ for 2¾″ bore to 9/64″ for 5″ bore.

Steel sleeves are sometimes used when high engine speed is desired. It is usual to manufacture them from solid drawn steel tubing, the boss for actuating being formed by extruding operations.

A sleeve of average diameter is fitted to the cylinder bore with a tight .003″ and a slack .002″ feeler.

The ball socket connection has evolved from a self-aligning ball bearing, to the present sphere zone, having a pressure die-cast babbitt socket cast in position. It is found that the fit of ball in socket can be varied by the pressure applied. Originally ball and socket were made detachable but this reduced bearing area due to flats milled on the ball to allow of assembly.

CYLINDER HEAD

A detachable head per cylinder has the advantage of obviating the use of a large casting and gasket. Any cylinder may be examined without disturbing the joint of the remainder. Explosion balance is assured as the combustion space is completely machined, while the spark plug is ideally placed and effectively water cooled.

Cast iron is usually employed, although aluminum is satisfactory and is used where weight is of first importance.

Many shapes of combustion chambers have been tried, and although the hemispherical type is theoretically ideal, it does not prove in practice to be as good as the cone frustum type.

The head is made a light push fit in the sleeve, and secured to the cylinder by four cap screws, an extra thin gasket being interposed between the head flange and cylinder. It should be noted that the head joint is not subjected to direct explosion pressures.

In common with other sleeve valve engines the power output improves as carbon builds up around the head.

A standard spark plug is used, the long reach plug and extension, characteristic of the early models has been discarded due to adoption of cone frustum type of cylinder head.

Freezing troubles have not been experienced in connection with the cylinder head, although at first sight this would appear a probable source of trouble. A syphoning tube is sometimes fitted.

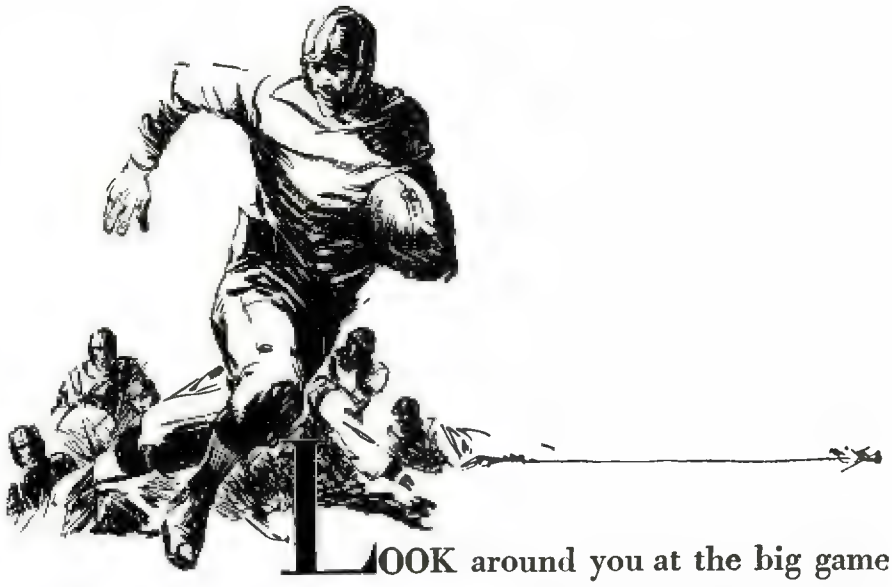
Due to the shape of the combustion chamber it is possible to adopt a comparatively higher compression ratio without fear of detonation, 5 to 1 being generally used on automobile engines.

GENERAL FEATURES

The chief advantages of a single sleeve valve engine are, sustained operating efficiency, good power output, and silence in operation.

A thousand hour test run under full load at 2000 r.p.m. was recently made on a six cylinder 2⅞″ bore by 4½″ stroke engine. During the first hundred hours the power

WATCH THE *YOUNGER CROWD* PICK THE WINNERS!



LOOK around you at the big game—and see the Fatima packages pop out! No gathering of the younger set, large or small, fails to extend this extraordinary record. Unquestionably, Fatima has pleased more smokers for more years than any other cigarette.

FATIMA

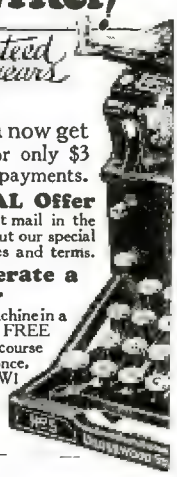
The most skillful blend in cigarette history

LIGGETT & MYERS TOBACCO CO.

You can now Own a Typewriter!

$3.00 DOWN and its yours

Guaranteed for 5 years



Think of it! You can now get a Genuine Underwood for only $3 down and small monthly payments.

Special FREE TRIAL Offer

Don't send any money now, just mail in the coupon for full information about our special free trial offer and special prices and terms.

Any One Can Operate a Typewriter

You can learn to write on this machine in a week's time! We will give you FREE a typist's manual and a FREE course in touch typewriting! Write at once, don't delay, send the coupon NOW!

Shipman-Ward Mfg. Co.,
2168 Shipman Bldg., Chicago
World's Largest Rebuilders

Name_____

Address_____

CHEMISTRY

Complete, practical home-study courses prepared by some of the best-known chemists in this country, including ALLEN ROGERS, B.S., M.S., Ph.D.—Head of Department of Industrial Chemistry, Pratt Institute; L. M. TOLMAN, Ph.D., Vice-president, United Chemical and Organic Products Co.; BRADLEY STOUGHTON, B.S.—Head of the Department of Metallurgy, Lehigh University, and OWEN L. SHINN, Ph.D.—Professor of Applied Chemistry, University of Pennsylvania.

Mail Coupon for Free Booklet

INTERNATIONAL SCHOOL OF CHEMISTRY
Associated with the
International Correspondence Schools
Box 6205-E, Scranton, Penna.

Without cost or obligation, please send me full details of your home-study course in

☐ Analytical Chemistry ☐ Metallurgical Chemistry
☐ Chemical Engineering ☐ Short Chemistry Course
☐ Industrial Chemistry ☐ Pharmacy

Name .....

Address .....

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 230 Fifth Avenue, N. Y. C.

www.americanradiohistory.com

Mechanical Engineering

Learn at Home

MECHANICAL Engineering embraces the design, construction and operation of machines and machine tools.

It is a profession which offers almost unlimited opportunities to men who combine natural mechanical ability with technical training.

For this is The Age of Machinery. Almost every convenience, luxury or necessity which we enjoy depends on machinery for its production or adaptability to our needs. Every new invention multiplies the opportunities for competent designers, builders, erecting engineers, etc.

One of the best ways to train yourself to secure a position as a Mechanical Engineer is through the home-study courses of the International Correspondence Schools.

These courses are complete and up-to-date, and they are especially arranged to meet the needs of the student who studies at home.

They are particularly helpful because they are written by well-known mechanical engineers who have had years of practical experience in this field and who know the quickest, best way to solve every problem.

Just mark and mail the coupon and we'll gladly send you Free Booklets describing the I. C. S. courses in Mechanical Engineering or any other course in which you are interested.

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 6206-E, Scranton, Penna.

Without cost or obligation, please send me one of your booklets and tell me how I can qualify for the position or in the subject *before* which I have marked an X:

☐ **Mechanical Engineering**	☐ **Toolmaking**
☐ **Mechanical Course**	☐ **Blacksmithing and Forging**
☐ **Drafting**	☐ **Patternmaking**
☐ **Mechanical Drawing**	☐ **Foundrywork**
☐ **Complete Shop Practice**	☐ **Machine Shop Practice**
☐ Electrical Engineering	☐ Architects' Blueprints
☐ Electric Lighting	☐ Contractor and Builder
☐ Radio	☐ Architectural Draftsman
☐ Railroad Positions	☐ Concrete Builder
☐ Civil Engineer	☐ Structural Engineer
☐ Surveying and Mapping	☐ Chemistry ☐ Pharmacy
☐ Metallurgy ☐ Mining	☐ Airplane Engines
☐ Steam Engineering	☐ Agriculture and Poultry
☐ Architect	☐ Mathematics

BUSINESS TRAINING COURSES

☐ Business Management	☐ Spanish
☐ Industrial Management	☐ French
☐ Personnel Organization	☐ Advertising
☐ Traffic Management	☐ Better Letters
☐ Business Law	☐ Show Card Lettering
☐ Banking and Banking Law	☐ Stenography and Typing
☐ Accountancy (including C. P. A.)	☐ Business English
	☐ Civil Service
☐ Nicholson Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Common School Subjects
☐ Private Secretary	☐ High School Subjects
☐ Salesmanship	☐ Illustrating

Name .....

Street Address .....

City ..... State .....

Play the HAWAIIAN GUITAR Just as the Natives Do
FREE when you enroll
$15 HAWAIIAN GUITAR and Case
Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly.
Play in Half Hour
After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge necessary.
Easy Lessons
Even if you don't know one note from another, the 52 printed lessons and the clear pictures make it easy to learn quickly. Pay as you play.
Free Guitar
and Outfit in Genuine Seal Grain Fabrikoid Case as soon as you enroll. Nothing to buy—everything furnished. No delay.
Write at Once
You'll never be lonesome with this beautiful Hawaiian Guitar. Write for Special Offer and easy terms. A postcard will do. ACT!

OTHER COURSES: Tenor Banjo, Violin, Tiple, Tenor Guitar, Ukulele, Banjo Ukulele — under well-known instructors.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc.
9th Floor, Woolworth Bldg., Dept. 140 New York, N. Y.
Approved as a Correspondence School Under the Laws of the State of New York

output gradually built up to 44 b.h.p. after which it remained constant until the completion of test. Measurement of sleeve driving gear back-leash was made by means of an extended arm attached to the sleeveshaft and although a maximum increase of .017" on pitchline was recorded, the gears ran as quiet as at start of test. On dismantling the engine it was found that the maximum wear on the piston skirt was .001" while the wear on the outside diameter of sleeve was undiscernible.

The adoption of a sleeve valve obviates such things as "grinding in" of valves, ingress of unwanted air through worn valve guides, valve distortion or sticking, clearance adjustment, valve spring breakage and frequent decarbonizing.

The rapid opening of ports, the type of port opening obtained, positive timing, unobstructed intake passages, and increased compression ratio all contribute to good power output.

Silence in operation is achieved by avoiding the hammer and anvil blows of a poppet valve, and the fact that the valve actuating mechanism does not extend outside of the engine body. The sleeve valve engine not only can be made to run quietly, but it stays quiet.

The weight of a single sleeve valve engine compares favorably with that of a poppet valve.

Building a Model of U. S. Brig of War "Truxton"

By WILLIAM A. CROSBY

(*Continued from page* 601)

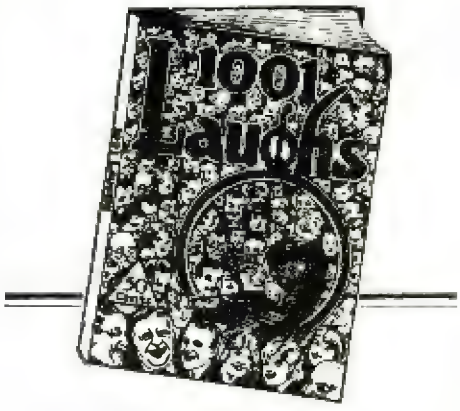
long ones which will run all the way down to the channels, two on each side of each mast. These, of course, also help to keep the mast from going over forward and are set up the same way that the main shrouds were.

In order to set sails on these ships it was necessary for the crew to spend much of the time aloft and in order for them to get from the deck to the different points, it was necessary to have some kind of a ladder. This ladder was formed by placing light pieces of rope across the shrouds so that a man could walk up or down. They were called ratlines and the process of putting them into position was called rattling down.

At the point where the lower shrouds come down to the channels, you may remember that we double knotted them, one knot down at the channels and the other a little above it. Just above this higher knot, on each set of lower shrouds, a piece of wire should be tied to each shroud, this piece of wire running exactly parallel with the top of the ship's railing. It is known as the sheer pole and forms the first step of the ratlines and also a place where some of the lighter ropes were fastened. It runs on all the shrouds so far erected.

Above this on all sets of lower shrouds, we have the first of the ratlines. This is made from thread a little lighter in weight than the cord used for the shrouds. It runs on the lower shrouds only, and does not cover the ones which have come all the way down from the topmast, 34. It begins at the first shrouds forward with a single knot, then is single knotted around each of the other shrouds in turn until all are tied. A little bit of glue should be placed on each knot so that it will not work loose. Of course the same thing is done on each of the other sets of lower shrouds.

The next ratline above this does not begin on the first shroud but on the second one, It is secured like the others. The third shroud is the same thing and so is the fourth, but the fifth begins at the first shroud again. Thus, every fifth shroud all the way up is made to begin at the first one, while those



1001 LAUGHS

The newest and funniest joke book in the world

Did you ever pick up a French, German or Spanish joke magazine and wonder what their specially good cartoons said?—Here's a brand new laugh book with hundreds of the best Foreign jokes and illustrated cartoons TRANSLATED INTO ENGLISH FOR YOU, together with plenty of good American humor and cartoons.

Relax from your daily grind, spend an hour a day in good old-fashioned laughter. It's a healthy recreation.

"1001 Laughs" is an extra-large size book. 9 x 12 inches, with over 300 illustrations. 116 pages of fun.

50c ON ALL NEWSSTANDS

or direct from

EXPERIMENTER PUB. CO. INC.
230 Fifth Avenue New York, N. Y.

The SECRETS of Your Hands!

FINGERPRINTS are used throughout the world as a means of apprehending criminals—but fingerprints are but a small portion of the secrets of your character that your fingers, your palm, even your handshake reveals.

Every inch of your hand has been charted by the experts of this highly developed science, so simply and accurately that anyone can learn the tell-tale signs by heart. Here is a brand new book with all the latest information—written in such a way that you can quickly master "Palmistry." **96 Pages, 9 x 12 inches. Full Page illustrations.**

PRICE 50c

ON ALL NEWSSTANDS

or direct from

EXPERIMENTER PUB. CO., INC.
230 Fifth Avenue, New York, N. Y.

www.americanradiohistory.com

in between only go from the second shroud aft. Of course all four sets of shrouds are fixed in this way.

The same procedure is followed in rattling down the upper shrouds, that is the shrouds which begin at the top of the lower masts and run to the topmast heads. Here, though, the ratlines are run all the way through and the skipping arrangement is not done. On the actual ship, these shrouds were about fifteen inches apart and according to scale, they should be about three sixteenths of an inch apart.

Probably this process of rattling down is one of the hardest on the whole model for it is simple repetition and takes lots of time. It is a good plan, perhaps to go on with something else and then return to the ratlines once in a while, but if you do this, don't let the model become too far advanced, for if this happens you will not be able to get in at the ratlines. Once the job is done, though, it is well worth while and will improve the looks of the model considerably. On some of the cheap models, these ratlines are simply glued to the shrouds but this is not good because they are apt to work loose in time and knotting them will make them look more realistic anyway.

Next above the topmasts we have the topgallant masts, but before these can be put into position, it is necessary to put in the head stays over the head of the topmasts. These head stays from the foretopmast run down to the end of the bowsprit and also to the end of the jibboom. The fore stay from the main topmast runs down to the cap of the fore mast. These stays are single and of the same size material as is used for the main and fore stays below.

When these are in position, the topgallant masts may be put in position, following the same scheme as is used for the topmasts. A rope ladder is arranged down the after sides of these masts to the next top below, the ladders being made just like the ratlines except that they are only two parallel ropes and are not in the form of shrouds.

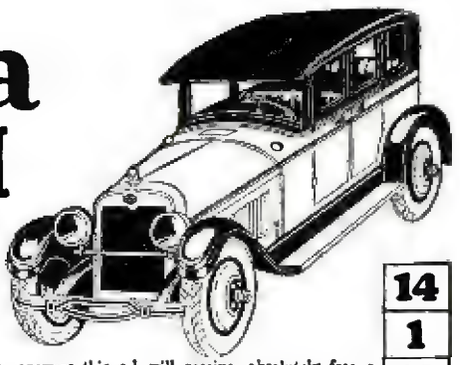
Side shrouds, though are arranged on the topgallant masts just as in the others, except that there are less of them and there are no ratlines to be put on. These shrouds are secured to the topgallant masts by tight loops about an inch down from the extreme end. The fore topgallant mast has a fore stay which runs down to the end of the jibboom from a point about half way between the fore top and the place where the shrouds are fastened to the topgallant mast. From the same point on this topgallant mast another fore stay is run to a point about an inch in from the end of the flying jibboom and from the point where the upper shrouds are secured to the topgallant mast, another head stay is run down to the extreme end of the flying jibboom.

On the main topgallant mast, the arrangement is much the same except that there are only two head stays instead of three. The lower of these runs from a point halfway between the topmast top and the end of the topgallant shrouds to the foretopmast top while the other comes from the place where the main topgallant shrouds are secured to that mast, to the half way point on the fore topgallant mast.

At the topmast tops, on each side and pointing aft and a little out toward the side, in the shape of a "V," we have what are known as spreaders. These should be made of light wood, such as a toothpick and are glued and pinned to the top, 35. From the place where the topgallant shrouds start two more on each side will be run to these spreaders and thence down to the channels where they will be secured to the same eyes that hold the topmast shrouds. The two, on each side, will be secured with

(*Continued on page 667*)

Win a NASH Sedan or $1400.00 Cash



Someone who answers this ad will receive, absolutely free, a fully equipped De Luxe Model Nash Sedan, or full value in cash if preferred ($1,085.00). In addition to this Nash Sedan we are also giving away, absolutely free, a latest model Chevrolet Coach or its cash value ($595.00), a Brunswick Panatrope Phonograph, a Six Tube, Single Dial Freshman Radio Receiving Set, a Corona Portable Typewriter and many other valuable prizes—besides Hundreds of Dollars in Cash.

14	
1	
19	
8	
19	
5	
4	
1	
14	

Solve This Puzzle Now! →

The numbers in the squares to the right spell two words. The alphabet is numbered. A is 1, B is 2, C is 3, etc. Can you make out what the two words are? When you do this, send me your answer right away. It may mean winning the Nash Sedan or $1,400.00 in cash.

$315.00 Extra For Promptness

In addition to the two automobiles, the many other valuable prizes and Hundreds of Dollars in Cash, we are also offering a Special Prize of $315.00 in Cash for Promptness. First prize winner will receive $1,400.00 in cash, or the Nash Sedan and $315.00 in cash. In case of ties duplicate prizes will be awarded each one tying. Get busy right away. Solve the puzzle and send me your answer together with your name and address written plainly. EVERYBODY REWARDED. Address

M. L. BOEING, Dept. 3798 323 So. Peoria St., Chicago, Ill.

"BECOME A LIGHTNING TRICK CARTOONIST"

Send $1.00 for Beginners Instructions with Laugh Producing Program of 23 Comic Trick drawings. Catalog of Chalk Talk Supplies Free

BALDA ART SERVICE, Dept. 4. Oshkosh, Wisconsin

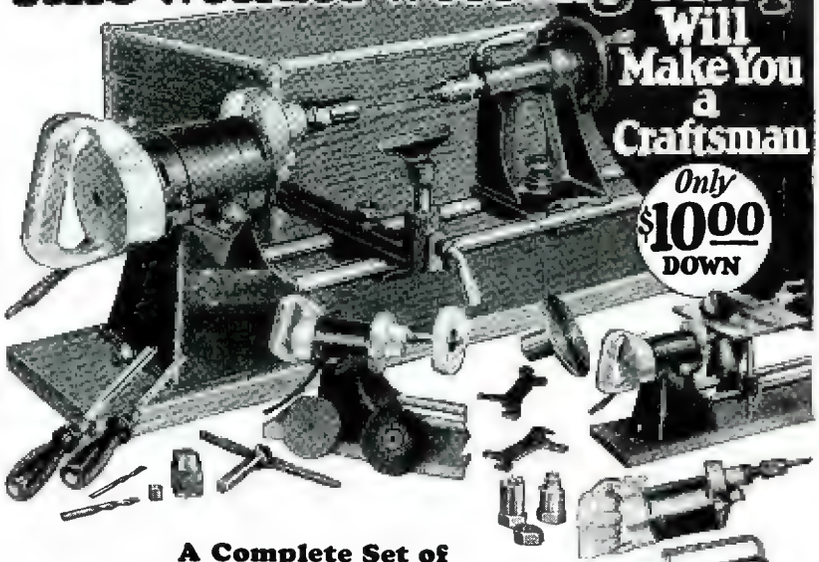
INCREASE YOUR INCOME 100%

Men and women. Write immediately for folder showing how to increase your income 100% or more without quitting your job or changing your business.

S. SERVICE 707 Quincy Bldg. Chicago

This Wonder Working Shop Will Make You a Craftsman

Only $10.00 DOWN



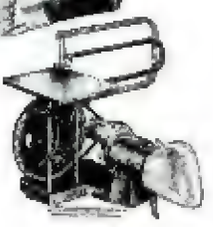
A Complete Set of Craftsman's Home Working Tools

Red Jacket electrically driven tools turn out work like magic. Here is a complete made to order workbench equipment of perfect, efficient and powerful craftsman's tools that are small and compact enough for portable use and so inexpensive that any man or boy may have one.

The RED JACKET Home Work Shop

RED JACKET A *chest* full of tools designed by a master for the private use of tool lovers and men who want to build, construct, invent and create at home. You will be able to make everything—attractive odd furniture, toys, home and garden improvements, all around manufacturing, repairing.

THE COMPLETE EQUIPMENT consists of a powerful Red Jacket Motor, with direct drive to the Waco precision wood turning lathe (capacity 9 in. x 34 in.); a bench saw, that has depth and side gauges, scroll and jig saw; and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to any light socket and converts your work bench into a complete private tool and machine shop.



The Waco Red Jacket GUARANTEE

If It Is Not What You Want When You Get It—Send It Back

Special Crafts Course FREE

SPECIAL CRAFTS COURSE and blueprint service is free to Red Jacket Shop owners—all that there is to know about handicraft methods, raw materials, woods, carving, sawing, turning, designing, carpentering, decorating, is taught by special correspondence.

Interesting Literature Free

Send the coupon. You will be surprised with all it contains. Beautiful, Instructive, Fascinating, Interesting.

Buy On Your Own Terms

Only $10.00 down. Liberal discounts for cash. Easy monthly payment plans. It is no hardship to own a Red Jacket.

Mail This To Waco

—10 DAYS' FREE TRIAL Our literature tells you how to start a job of your own. If you are not pleased return the Shop.

WACO TOOL WORKS, Inc.
542 N. Parkside Ave., Chicago

Manager, Dept. 211. Please send me particulars about 10-day free trial, free blueprints, and $10 down payment.

Name.....

Address.....

www.americanradiohistory.com

Build the STROBODYNE with the *new* improved "Consrad" BOOK Pattern

Price 50¢ *including* 4 full size Blue Prints

THE sensational Strobodyne circuit, the greatest of Super-Heterodyne receivers that combines the best features of every circuit and has amazed Radio, is now ready for home and community set builders.

Consrad, the greatest radio book and Pattern publishers, has printed a brand new pattern for this amazing Strobodyne circuit.

A sixteen-page, 9x12, book gives every last detail in the building up of reliable Strobodyne receivers.

In this booklet are drawings and photographs of various parts of the receivers. The few parts of the hook-up that require special attention are fully covered by special simple instructions.

FULL SIZE BLUEPRINTS

With this Strobodyne pattern come four full size blueprints. These blueprints are complete, accurate and highly simplified. Anyone can build a Strobodyne receiver, whether they have built a radio set before or not.

The Blueprints are as follows:

No. 1. Panel layout Blueprint—Size 11x27 inches.
No. 2. Sub-Panel Layout.
No. 3. Wiring for Apparatus (Shown in perspective form)—Size 23x27 inches.
No. 4. Underside view of Sub-Panel—Size 16x27 inches.

Until you have studied the Strobodyne you are a back number in Radio—a man of the older school—the Strobodyne is not just a new circuit—It is an epoch in Radio.

50c THE COPY

USE THIS COUPON

CONSRAD COMPANY, Inc.,
230 Fifth Ave., New York.

Gentlemen: I enclose 50c for one copy of the New Official STROBODYNE PATTERN containing complete constructional information and all Blueprints.

Name .....

Address .....

City, State .....

www.americanradiohistory.com

Boys—Write Today For this Book FREE!

EVERY boy will want this new, thrilling and beautifully illustrated book. It is a most interesting story and tells you all about the new Meccano. It fully explains the fun and ease with which you can build hundreds of wonderful working models in colors, such as steam shovels, wrecking cars, cranes, bridges, etc. These models are exact duplicates of the real engineering machines from which they are copied.

$500 Cash Prize

With this book you will receive an entry blank for the great Meccano Prize Contest—first prize $500 in cash. You may be the lucky boy. No experience necessary.

Write today. The book and entry blank will be sent to you free upon receipt of your name and address and the names and addresses of three (3) of your friends. Put No. J-1 after your own name for reference.

Meccano Company, Inc., Div-J-1, Elizabeth, N. J.

MECCANO

RADIO AT WHOLESALE

Write for my Big 1928 Radio Catalog—just off the press. Thousands of marvelous bargains in nationally advertised goods. All the LATEST IN RADIOS and equipment. Lowest wholesale prices. Agents Wanted.

It's a regular encyclopedia on Radio. All about trouble finding. **FREE Log and Call Book** and Catalog. Get your copy today. Send postcard now!

FREE

DEALERS NEW 1928 CATALOG

American Auto & Radio Mfg. Co.
HARRY SCHWARTZBERG, PRES.
Dept. 273 American Radio Bldg., Kansas City, Mo. 3

FLY THE METEORPLANE

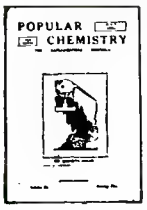
Build this plane and learn by practical experience to construct and operate aircraft. Use your motorcycle engine or the IRWIN 20 hp. motor. Parts furnished very reasonably to build this little "Meteorplane," the World's first light plane. Send $3.50 for complete set of blue prints and parts price list of this latest Model M-T-2.

IRWIN AIRCRAFT COMPANY, Sacramento, California

MEN WANTED
TO LEARN
Motion Picture Projection
$2,000 to $4,000 a Year

Quickly learned. Short hours, big pay. Best equipped school in Michigan. Projectionists for Movie Houses and Road Shows.

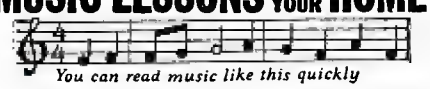
MOVIE OPERATORS SCHOOL
61 Sproat Street, Dept. 4, DETROIT, MICHIGAN



POPULAR CHEMISTRY
A Monthly Chemical Magazine

Latest chemical news, experiments, formulas, answers to chemical questions, new compounds and their preparation, etc. Three trial copies 30 cents. $1.00 per year. Solubility chart and book catalog sent free to yearly subscribers.

POPULAR CHEMISTRY COMPANY
Dept. NB Swedeshoro, N. J.

MUSIC LESSONS IN YOUR HOME

You can read music like this quickly

Write today for our **FREE BOOKLET.** It tells how to learn to play Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc. Beginners or advanced players. Your only expense about 2c per day for music and postage used.

AMERICAN SCHOOL of MUSIC, 57 Manhattan Bldg., Chicago

STOP WATCHES

Needed for Accurate Laboratory Timing. The "Pastor" is a guaranteed fifth-second timepiece. Unbreakable crystal. Price only $7.50. Start, stop, flyback hand. Or a fifth-second Timer only, 30 minute register, 6 jewel. Price only $11.25.

Write today to
Sterling Stop-Watch Co., M'n'f'r
15 East 26th St. New York, N. Y.

Building a Model of U. S. Brig of War "Truxton"

(*Continued from page 665*)

a piece of thread and will be about an eighth of an inch apart on the spreaders. All of the rigging on the topgallant masts should be considerably lighter than that of the topmasts and lower masts. This includes the forestays and shrouds.

You should now secure your tube of white oil paint and mix up a little with some turpentine and paint the lower masts and tops white. The topmast tops will also be painted white and also the extreme upper ends (trucks) of the topgallant masts. In between, the color will be an orange yellow or buff as it is better known. The lower shrouds and ratlines as well as the topmast shrouds and ratlines should be black but the lighter rigging may be either black or white.

The yards represent simple repetition and they should be cut to length, planed down and sandpapered. They should then be painted the same color as the masts with the extreme ends painted white. The lower yards, known as the fore and main, are out far enough from the masts so that when the topmasts are lowered they will slide between these yards and the lower masts, 36. This is accomplished by means of slings which may be made of metal or the mahogany cardboard, painted black after it is in place. The drawings 37 and 38 show clearly how these should be made and no further explanation is necessary. About one quarter of an inch from the ends of these lower yards, place two of the little wire eyes, one on the after side and the other on the upper. Another is put exactly amidships between the bands for the slings.

This one in the center is connected with a light piece of chain which runs up through the lubber holes in the tops and is secured in place, 39. If you have no chain which is small enough (it must be very small,) use a piece of the same size thread used for the lower shrouds.

From the eyes on the upper sides of the yards at the ends, run a piece of light thread to a small white bead which is secured to the caps of the lower masts by means of a piece of the thin wire, 40. The thread is then run down to the fife rail around the foot of the mast on deck. The same process is followed for the end of each of the lower yards. These are called lifts.

From the remaining eye on the ends of the yards, put another of the little beads with a short wire link to connect the two. Through this bead run a piece of thread one end of this is secured to the bumkin while the other end is passed through another bead and tied to it. Another piece of the thread is run also through this same bead and one end of this is fastened to the eye in the bumkin while the other end is lead to the stern deck where it is secured to the pin rail. The same procedure is followed for the other end of the fore yard and it is repeated twice more for the ends of the main yard. These are the braces.

All these yards are equipped with foot ropes so that a man can walk out to handle the sails. These are simply secured to the outer ends of the yards and permitted to hang down a little with the inner end secured to the yard on the opposite side of the center so that there is an overlap at the center. All yards are so equipped.

The topmast yards are secured next. These do not have the heavy slings like the lower yards but have the same eyes arranged

Beck Makes $8000 a Year!

"If it wasn't for you and the training you gave me, Mr. Dobe, I wouldn't be making $8000 a year now."

Lewis Beck

Learned Drafting at Home—
So Can You!

Beck answered my advertisement and got my free book on Draftsmanship. That's what I want you to do now. Beck was then a helper making $12.00 a week, but he took my simple, easily understood and quickly learned course in drafting at home without giving up his job. You can do the same thing. Will you? "I often look back to the time I answered your advertisement," writes Beck, "and wondered how I could take up your course as I was not able to save enough out of $12.00 a week to make the first payment. But I finally did it and it was the best money I ever spent in my life. Thanks to your training I am not afraid to tackle any work along drafting lines and can readily master all the architect's plans."

Mail this Free Coupon or Write Today for FREE Book!

Beck asked for the Free Book first! Will you ask for it today? Certainly you are not obligated at all by writing for "Successful Draftsmanship." Get it and read it. Then make up your mind how successful you can be. This man is making real money and you know the old adage "What man has done man can do." So mail the Free Coupon below—or write a letter or a post card. Do that now. No man who is dissatisfied with what he is making now should fail to get and read "Successful Draftsmanship."

DOBE EASY DRAFTING
1951 Lawrence Ave.
Div. 14-28 Chicago

Dobe Easy Drafting
1951 Lawrence Ave., Div. 14-28 Chicago

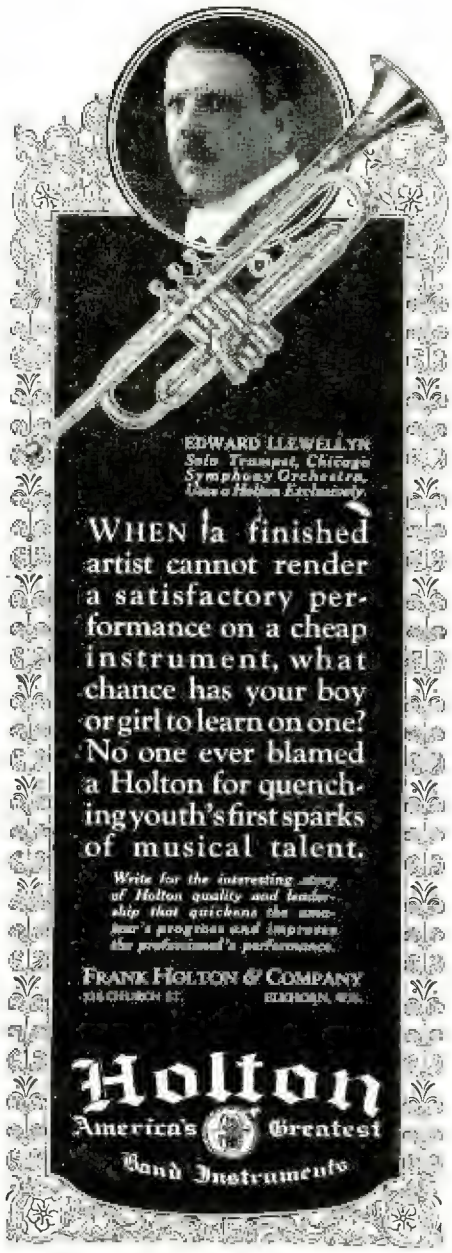
You may send me free your book "Successful Draftsmanship" and names and addresses of more Dobe winners.

Name..... *Age*.....

Address .....

Post Office..... *State*.....

www.americanradiohistory.com


EDWARD LLEWELLYN
Solo Trumpet, Chicago Symphony Orchestra
Uses a Holton Exclusively
WHEN a finished artist cannot render a satisfactory performance on a cheap instrument, what chance has your boy or girl to learn on one? No one ever blamed a Holton for quenching youth's first sparks of musical talent.
Write for the interesting story of Holton quality and leadership that quickens the amateur's progress and improves the professional's performance.
FRANK HOLTON & COMPANY
Holton
America's Greatest
Band Instruments

High School Course in 2 Years

This simplified, complete High School Course—specially prepared for home study by leading professors—meets all requirements for entrance to college, business, and leading professions.

20 Other Courses

Over 200 noted Engineers, Business Men, and Educators helped prepare the special instruction which you need for success. No matter what your inclinations may be, you can't hope to succeed without specialized training. Let us give you the practical training you need.

American School
Drexel Ave. & 58th Street
Dept. H-826, Chicago

Money Back When You Finish If Not Satisfied

American School, Dept H-826, Drexel Ave. and 58th St., Chicago
Send me full information on the subject checked and how you will help me win success in that line.

.....Architect	.....Electrical Engineer
.....Building Contractor	.....General Education
.....Automobile Engineer	..... Lawyer
.....Civil Engineer	.....Mach. Shop Practice
.....Structural Engineer	.....Mechanical Engineer
.....Business Manager	.....Steam Engineer
.....C. P. A. & Auditor	.....Sanitary & Heating
.....Bookkeeper	..... Surveyor & Mapping
.....Draftsman & Designer	.....High School Graduate

Name.....

Address .....

at the ends and center. These topmast yards are lowered, for the ship has no sails, and therefore will come directly on the fore and main caps. The fine chain is used again, but this time it leads from the center of the yard up to a point just below the topmast top, where it passes through a small hole in the mast and down the after side. At a point about an inch below where it comes out on the after side, a bead is tied into the end and through this bead a lighter thread is run down, on one side to the eye in which the after shroud is fastened. On the other side, the end is tied to another bead and a thread run through this from the eye on the other side of the deck, through the bead and down again to its starting point. The same thing is done with the other yard. These are the halyards.

(*To be continued.*)

Sound Compass Conquers Fog

By H. H. DUNN

(*Continued from page* 591)

of placing one receiver at the bow of a vessel and another at the stern, with their indicators side by side in the pilothouse, it is possible by another device also invented by Mr. Rieber, to tell instantly the distance of the sound-producing instrument from the ship carrying the sound compasses. The distance, in fact, can be automatically pointed out by a needle playing across an arc divided to represent feet or meters.

While the main object of the sound compass, of course, is to enable ships to avoid collision in fog, it also has another important value in navigation. By placing whistles or sirens on piers, wharves, berths, docks or ferry slips, and operating them at a sound-pitch beyond that audible to the human ear, it is possible for the pilot or captain of a ship equipped with the sound compass to steer his ship directly to such berthing place, even when it is entirely invisible to him. Sound beacons of supersonic sound producing capacity have been devised, and are being experimented with on the ferry slips in San Francisco Bay.

Similarly, points of land jutting out into the water, lighthouses, reefs, shoals, islets, rocky peaks and other menaces to navigation can be similarly marked with whistles or sirens and their location told to the navigator by the silent red light on the sound-compass indicator. Buoys and other marks may be so made "visible" to the pilot or captain in fog, storm or the darkest night. These supersonic sirens do not in any way interfere with the noise of the regular and audible whistles and sirens of sea traffic, and are completely inaudible to the human ear.

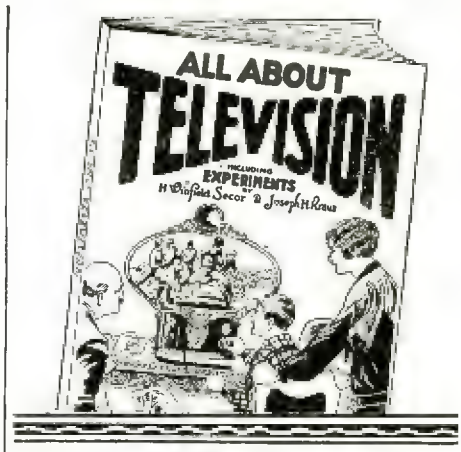
The indicator cares for echoes by showing a weak flash in exactly the opposite direction to the brilliant flash shown in the midst of the whistle blast or other signal. Thus the navigator need not be confused by the echo of a signal, even though he hears it clearly.

FRENCH HUMOR

is a new magazine now published by the sponsors of

SCIENCE AND INVENTION.

Don't miss the snappy French wit and the illustrations by the best of French artists.



TELEVISION *is Here!!!*

Radio Fans! Mechanics! Scientific Men!—Everybody—Build a TELEVISION SET. The greatest and most amazing development of the 20th Century

HERE, friends, is the first book to be published giving you the history of TELEVISION, from the first crude experiments at the beginning of the 20th Century—to the comparatively perfect machines just put into daily operation. From this book you can build your own, workable television set that will serve as a fundamental apparatus for hundreds of tremendously interesting and amazing experiments.

Get in now on this new development. You may be fortunate enough to discover some improvement to Television that will be worth many thousands of dollars.

Start with a copy of this new book today. 116 Pages, 9 x 12 inches, illustrated.

50c ON ALL NEWSSTANDS

If your Newsdealer cannot supply you, use this coupon.

EXPERIMENTER PUB. CO., Inc.
230 Fifth Ave., New York, N. Y.

Gentlemen: I enclose 50c for one copy of "ALL ABOUT TELEVISION."

Name .....

Address .....

City, State .....

www.americanradiohistory.com

Orders-Inquiries

60 pages — Send for FREE copy — Can be Secured by MAIL

POLK'S REFERENCE BOOK and Mailing List Catalog

Gives counts and prices on over 8,000 different lines of business. No matter what your business, in this book you will find the number of your prospective customers listed.
Valuable information is also given as to how you can use the mails to secure orders and inquiries for your products or services.

Write for Your FREE Copy
R. L. POLK & CO., Detroit, Mich.
Largest City Directory Publishers in the World
Mailing List Compilers—Business Statistics
Producers of Direct Mail Advertising

Electricity!

Learn in Los Angeles

Be an electrical specialist. Gain quick success in this most fascinating and profitable field. Learn at National in the center of tremendous electrical projects costing more than $100,000,000.00 — unlimited opportunities now.

Practical, intensive training by National's job-experience method in 6 to 9 months. All technical essentials included. School endorsed by leaders in electrical industry. You learn all branches of electricity, including radio. Million dollar institution; all modern equipment and training facilities. Life scholarship. No age limit. Free employment service. Earn living expenses while training. Over 17,000 successful graduates. 23rd year. Big, illustrated 84-page catalog sent FREE. Write today.

FREE BOOK

NATIONAL ELECTRICAL SCHOOL
Dept. 286, 4006 So. Figueroa, LOS ANGELES, CALIF.

DOUBLE Your PROFITS

Send for our catalog, just off the press, chock-full with all the latest best sellers in Novelty Jewelry, Silverware, Cutlery, Leather Goods, Electrical Appliances, Useful Household Articles, Gifts, etc.

Sample Bargain Offer 4 Piece
FRENCH BRIAR PIPE SET
$12.00 Dozen
Sample Outfit $1.25 Plus Postage
Amberlite stems, plush lined box. Retails as high as the $10.00 price stamped on box.

H. SHAPIRO, Dept. D26, 81 Bowery, New York, N. Y.

PIMPLES

Cleared Up—often in 24 hours. To prove you can be rid of Pimples, Blackheads, Acne Eruptions on the face or body, Barbers' Itch, Eczema, Enlarged Pores, Oily or Shiny Skin, simply send me your name and address today—no cost—no obligation. **CLEAR-TONE** tried and tested in over 100,000 cases—used like toilet water—is simply magical in prompt results. You can repay the favor by telling your friends; if not, the loss is mine. WRITE TODAY.
E. S. GIVENS, 468 Chemical Bldg., Kansas City, Mo.

MAKE 7½ DOLLARS EVERY DAY Right In Your Home, Start Anywhere, Any Time. 1 Dollar Money Order will bring you complete Information and VALUABLE OFFERS Magazine for 12 Months.

A. CERVENEC SYSTEM, Box 4, Buffalo, N. Y.

The Astrology Humbug

By JOSEPH H. KRAUS

(*Continued from page* 599)

guessers in the world. He was right not to exceed six times in his predictions for the thirty-one days of August. The ordinary laws of chance would have given him a better record than that. If the varieties of possible weather had been labeled and put into a hat and a small child allowed to draw out a prophecy for each day, the score of hits could not have failed to be much higher. Then if the child had only been called an astrologer, the thing would have looked much better for astrology than does the test referred to. Evidently, if anybody is to be blamed for the bad weather in August, the fault is not in our stars."

Here are the reports for the month of August, the predictions given in light type, and the facts immediately thereunder in bold face type.

Aug.
1—Warm and muggy with showers in evening.
1—Humidity 91 to 94. Temperature maximum 81. Thunderstorms, heavy rain in the P. M., with a fall of the thermometer to 69.
2—Overcast, foggy and rainy.
2—Bright and cool. Highest temperature 78. Humidity 57.
3—Wet and clearing; fair toward sunset and getting warmer.
3—Clear and cool. Maximum temperature 70. Humidity 52.
4—Clear and warm.
4—Clear and cool. Maximum temperature 74.
5—Rising temperature.
5—Clear in A. M. Showers in P. M. Maximum temperature 75.
6—Hot; fair in afternoon.
6—Fair all day. Maximum temperature 76.
7—Very hot; cloudy in some localities.
7—Partly cloudy. Maximum temperature 79. Humidity 82.
8—Warm; possible rain before sunrise, but generally clear.
8—Maximum temperature 77. Thunderstorms in the afternoon and a succession of heavy rainfalls.
9—Fair.
9—Rainy in the morning. Maximum temperature 80, with a drop to 68 at 10 P. M.
10—Northerly breezes; overcast in afternoon and evening.
10—Northwesterly wind. Clear all day. Maximum temperature 77.
11—Wet, cloudy and stormy.
11—Fair all day. Maximum temperature 75.
12—Steady rain.
12—Cool and fair. Not even a shower.
13—Rain in morning; showery; clearing in spots.
13—Partly cloudy. Maximum temperature 78.
14—Early drizzles; clearing; variable.
14—Cloudy in the morning. Showers in the afternoon and evening. Maximum temperature 73.
15—Moist and hot.
15—Clear and cool. Humidity down to 52. Maximum temperature 73.
16—Very hot.
16—Clear and cool, north winds, maximum temperature 72.
17—Damp and hot.
17—Low humidity, 47 to 60. Maximum temperature 79.
18—Muggy, with warm, moist winds.
18—Showers morning and afternoon. Cold winds. Maximum temperature 62.
19—Clear and warm.
19—Cloudy in A. M. Clear in P. M. Maximum temperature 69.
20—Hot, with some relief from fitful breezes.
20—Fair. Maximum temperature 72.
21—Clear and hot.
21—Cloudy. Maximum temperature 72.
22—Dry and warm.
22—Foggy and humid. Maximum temperature 71.
23—Cloudy, with local rains.
23—Foggy and cloudy with showers. Maximum temperature 72.
24—Warmer and unsettled.
24—Cool northwest winds. Maximum temperature 72 down to 61 in the evening.
25—Cloudy and warm.
25—Clear and remarkably cool. Thermometer down to 55 in morning.
26—Hot and variable.
26—Cloudy, rain at night. Maximum temperature 66.
27—Pleasant, warm and variable.
27—Northeast winds and showers all day. Maximum temperature 62.
28—Cooler, but far from cold; breezes.
28—Rain off and on all day. Maximum temperature 64.
29—Cloudy, overcast and threatening.
29—Cloudy with showers in the afternoon. Maximum temperature 73.
30—Windy and moist.
30—Fair and warmer. Maximum temperature 76.
31—Cold and rainy.
31—Warmer and clear. Maximum temperature 76.

BE A MAN

and Be Able to

TAKE A MAN'S PART

By Learning the Manly Art of Self Defense Right in Your Own Home

The MacMahon Boxing Course

includes every known boxing trick as well as the most valuable methods of working into condition and keeping that way. Never was there a more thorough course written on boxing. In order to give you an idea of its thoroughness, here are a few of its chapters:—The Training Routine; Proper Diet for Fighters; Studying Your Opponent; How to Clench the Fist; What are Fouls?; The Hands; The Body; The Eyes; How to Practice; The Proper Use of These Parts of the Body; Clever Footwork; How to Advance; How to Retreat; Circling Your Man; Preliminary Sparring Motions; Back Stepping; Snapping Away; Taking Ground to Right and Left; Side Stepping; Dodging or Head Slipping; How to Dodge Right Hand Leads; Ducking Left-Arm Swings; Follow-Up Work; Feinting and Drawing; Feinting and Dodging; Defense; Guarding and Blocking; Cross Guards; Opposite Parries and limitless blows, blocks, counters, etc.

You never know when you will be called upon to defend a friend from the insults of street corner bullies and ruffians.

8 Oz. Boxing Gloves

"For Those Friendly Bouts"
Reinforced and Heavily Padded So No Part of the Hand Can Injure or Be Injured

$5.00 A Set of 4 — With Boxing Course **$7.00**

Worth Twice What I Ask

The MacMAHON COURSE and Boxing Gloves

Will Make a Good Boxer Out of YOU In a Few Weeks' Time

Charles MacMahon
180 W. Somerset St., Studio S-I-10-27,
Philadelphia, Pa.

Dear Sir: Enclosed find remittance for the offer checked below.

- ☐ Set of 14 oz. Instructors' Gloves..... $12.00
- ☐ Instructors' Gloves with Course..... 14.00
- ☐ Set of 8 oz. Boxing Gloves..... 5.00
- ☐ Boxing Gloves with Course..... 7.00
- ☐ Set of 5 oz. Fighting Gloves and Course..... 5.00
- ☐ Boxing Course only..... 3.00

Name .....

Address .....

City .....State.....

www.americanradiohistory.com

PLUMBING & HEATING CATALOG FREE

Buy direct and save 50% on Plumbing and Heating Supplies of the highest quality. Send for OUR FREE CATALOG showing net plumber's prices on Bathroom Outfits, Kitchen Sinks, Laundry Tubs, Lavatories, Toilet Outfits, Bathtubs, Boilers, Heaters, Pipe and fittings, Paint, Tools, etc. Install them yourself.

Money Back Guarantee with every purchase.
(Members Phila. Chamber of Commerce)

PENN MDSE CO. 3RD & MARKET STS. PHILADELPHIA, PA.

MAIL COUPON

PENN MDSE. CO., INC.
3RD & MARKET STS., PHILA., PA.
Without obligating me in any way, please send me your free book showing net low prices for plumbing supplies.
Name .....
Street .....
State .....

The Old Reliable Credit Jewelers LOFTIS BROS. & CO. Estd 1858 Dept. F22 108 N. State St. Chicago Ill.

Satisfaction Guaranteed or Money Back

DIAMONDS

Genuine Diamonds Guaranteed

For lower prices and a better selection—order your gifts from Loftis! See these three great specials—your choice at $43.75 each—tremendous values! Rings and watches are 18K solid white gold set with dazzling blue white Diamonds! Terms: $4.37 down, balance payable weekly, semi-monthly or monthly. Shipped (NO MONEY DOWN) subject to your free examination, on request. SEND FOR FREE CATALOG!

Learn WATCHMAKING!

Earn Up To $100 a Week

Steady employment. High wages! Trained men in demand. We help you get big-pay job or you can open your own repair shop. We teach Watchmaking, Watch and Clock Repairing in a few months. No classes. Personal instruction, day or night. Work your way through—we help you get part-time job. Amazing opportunities! Write for interesting book today. Free Book

Wm. Bold, Director
NATIONAL SCHOOL OF WATCHMAKING
1340 South Michigan Avenue Dept. 12 Chicago, Ill.

DRAW CARTOONS

TURN YOUR TALENT INTO MONEY

Cartoonists earn from $50 to $150 per week—some even more. Remarkable new Circle System of Drawing teaches you in half the usual time. Send for booklet and sample lesson plate explaining full details of the Course. No salesman will call.

THE NATIONAL SCHOOL OF CARTOONING
628 Penton Building Cleveland, Ohio

Wonderful, new device, guides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Ozment, Dept. 44 St. Louis, Mo.

Readers Forum

(Continued from page 619)

INTERPLANETARY TRAVEL

Editor, SCIENCE AND INVENTION:

The various discussions in the Readers Forum are interesting, but none more so to me than those involving interplanetary travel and life on other spheres.

Recently, in a debate on this subject, a friend advanced the law of averages. "Why," said he, "If millions of the countless worlds in space are inhabited and travel is possible, should the humans on our particular little earth be the first to make such a journey? The chance in our favor, is so very small that it seems an impossibility."

I was stumped for a while, but finally came back with the suggestion that, inasmuch as the nearest solar system is four light years distant and navigable speed would probably be much less than that of light, making the time consumed in such a trip exceeded that of a life span; no one would wish to start, when he could not possibly live to arrive at his destination. I departed with self thought laurels; for I hope to live to see ships launching out for Mars and elsewhere.

You are to be complimented on the type of magazine embodied in SCIENCE AND INVENTION. It covers the scope, which its name implies, very well; although personally, I would like to see more data on gravitation, and pros and cons on interstellar transportation, etc. For example, what degree of hazard would be involved from meteors, in a trip to the moon? Would not a meteor passing by at a greater velocity than that of the transport, be difficult to cope with?

The art of traveling through space may be termed fantasy; nevertheless, it is a desirable fantasy, and one which may, in the distant future, be essential to the survival of our race.

EVERETT S. ROOP,
San Francisco, Calif.

(Undoubtedly your friend, when arguing with you, did not refer to interplanetary travel between different solar systems because that in itself would be almost an absolute improbability. There is really no reason for us traveling to our own sun, let alone any of the other suns in the universe, and worlds about which we know nothing. But when speaking of interplanetary travel, one refers primarily to the inter-communication between this planet and Mars or Venus. Now, Mars' average distance from the Earth is 48,600,000 miles, but when opposition occurs near the planet's perihelion this distance may be reduced to 34,600,000 miles. It would require light traveling at a speed of 186,000 miles per second, a little more than three minutes to come from this planet and the entire route to the planet could be accomplished well within a year, if a speed of a little more than 5,000 miles per hour were maintained. We assume, of course, that this is the speed average after leaving the gravitational pull of this earth. Such a speed is not preposterous. Due to the fact that friction is practically eliminated in space, the project is well within plausibility. Already modern high-powered rifle bullets have been able to attain a speed of 3,500 miles per hour. Why could not this speed be increased to 5,000? Then again, one must remember that the force was exerted upon the bullet all at one time. The bullet had absolutely no opportunity of releasing additional charges and thus accelerating its speed. If we could start out with a speed of 100 miles per hour, or 200 miles per hour, of which modern airplanes are capable, and accelerate this by only half its value again, it is obvious that we could drop off into space and proceed to the nearest planetary body. We would not consider that a year's time or even two years' time would be an individual's life span; neither would there be any danger in space of meteoric bodies or other planetary particles. There are certain seasons of the year when we are bombarded with meteoric showers and other seasons when the sky is relatively free of such illumination. But we must remember that the earth is of tremendous size in comparison with a rocket and the chance that the interplanetary vessel will miss all of these meteors in its trip through space, is indeed great. Already there has been talk of sending a rocket to the moon. It has been calculated that the rocket would reach the surface of the moon in about twenty-six minutes. It need not necessarily be aimed directly to hit its target, but could be so directed that its power would be cut off the moment it entered into the gravitational pull of that body, after which the rocket would strike the surface. Prof. Goddard has demonstrated that a greater speed can be obtained with a rocket when the same acts in a vacuum than when operating in air. We may, during our generation, see rockets traveling to the moon and we will not need to stretch the imagination very far to that point when the rockets will be replaced by passenger-carrying carriers, capable of duplicating the experimental principles.—EDITOR.)

REMOTE CONTROL

Mechanical Model $18.00
Electrical Model $60.00
(Add 10% west of Rocky Mts.)
Write for illustrated descriptive circular

Imagine the pleasure of tuning your radio without having to get up once all evening! Turn set "on" or "off," tune, regulate volume—from your easy chair! Easily attached to any single removable dial receiver in a few minutes.

ALGONQUIN ELECTRIC COMPANY, Inc.
245 Fifth Avenue, New York City

Algonquin

REMOTE CONTROL RADIO TUNING UNIT

TRAVEL for "Uncle Sam"

New Bandit Proof Railway Mail Car

U. S. Government Jobs

$1140 to $3,000 Year

Men, Boys, 18 Up

Steady Work
Paid Vacations
Common education Sufficient

Mail coupon today—SURE

COUPON

Franklin Institute
Dept. R-182, Rochester, N. Y.
Rush to me without charge 32-page book with list of U. S. Government big paid positions. Advise me regarding the salaries, hours, duties, vacations and send me full particulars.
Name .....
Address .....

CAN YOU SELL GAS AT 5c PER GAL.?

Any man who can sell gas at 5c. per gallon should write at once to Frank Andrews, Dept. 863-P, 154 E. Erie St., Chicago, Ill. His agents make as high as $3,000.00 a month. Send for free trial, proof and $15.00 a day guarantee to Distributors.

BOUND VOLUMES AT GREAT SACRIFICE

12 full issues of back magazines, handsomely bound in stiff cloth covers, tremendously valuable for reference and other uses, for sale at great price reductions to make room.

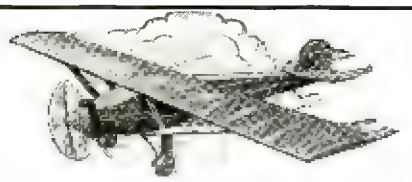
Price $2.50, Worth $10.00

ELECTRICAL EXPERIMENTER—
May, 1917, to April, 1918
PRACTICAL ELECTRICS—
November, 1922, to October, 1923

Other Volumes advertised elsewhere in this issue.

EXPERIMENTER PUB. CO., Inc.
230 Fifth Ave. New York, N. Y.

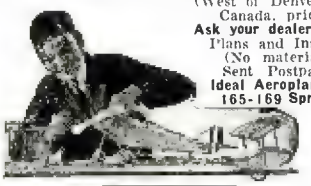
www.americanradiohistory.com



Build and Fly a 3-ft. Model of
LINDBERGH'S
NEW YORK—PARIS
MONOPLANE

Plans for Other Model Airplanes 25c per set
FOKKER North Pole Plane
CURTISS J N 4 D-2 Plane
DeHAVILLAND World Flyer
NC-4 Naval Seaplane
Bleriot, Nieuport or Taube Monoplanes
Cecil Peoli Racer Plane
[All 9 plans for $2.00]

This IDEAL New York-Paris Monoplane is a perfect copy, 3-ft. size, of the "Spirit of St. Louis," in which Lindbergh crossed the Atlantic Ocean. Any bright boy can build this model. The IDEAL Construction Outfit contains everything needed: all parts, fittings, materials and supplies, including careful instructions, plans and diagrams. The model is wonderful; has many features of the original and is guaranteed to fly. Complete Construction Outfit $7.50
(West of Denver, Colo., and in Canada, price is $8.00)
Ask your dealer or order direct.
Plans and Instructions Only (No materials included) Sent Postpaid for 25c.
Ideal Aeroplane & Supply Co.
165-169 Spring St., N.Y.C.



Catalog of Model Airplanes, Parts, Supplies, etc., 5c postpaid

TYPEWRITER PRICES CUT

Your choice of the World's best typewriters – Underwood, Remington, Oliver – full size, late model, completely rebuilt and refinished brand new. Prices smashed down to half. Act quick.

Free Trial

$2 and it's yours

Just send your name and address and we will mail you our complete FREE CATALOG prepaid, fully describing and showing actual photographs of each beautiful machine in full colors. Tells every detail of our direct-to-you small-payment plan. Write now for tremendous saving. No obligation whatever. Still time if you act now.

International Typewriter Exchange
186-188 W. Lake Street. Department 1117 Chicago, Ill.

Anyone CAN LEARN!
No talent or experience necessary. Fascinating work. Pays big money. Complete instruction book TELLS ABOUT: Alphabets, Colors, HOW TO MIX PAINTS, Show Cards, Window Board and Wall Signs, Ready made letters, Gilding, TRICKS OF THE TRADE, also gives 100 Alphabets and Designs. Book bound in flexible lmt. leather, gold edges, and four ball bearing Show Card Pens. Book and Pens sent postpaid for $3.00. (C. O. D 10c extra.)
How to Paint SIGNS and Show Cards
OgilviePub.Co.,57RoseSt.Dep.109,NewYork
EARN MONEY IMMEDIATELY— WE FURNISH EQUIPMENT TO START

Do Your PRINTING
Cards, Stationery, Circulars, Paper, etc. Save money. Print for others, big profit. Complete outfits, $8.85. Job press $11, $29, Rotary $149. All easy, rules sent. Write for catalog presses type etc. THE KELSEY CO., T-47, Meriden, Conn.

Is This Possible?

By JOSEPH H. KRAUS

(*Continued from page 590*)

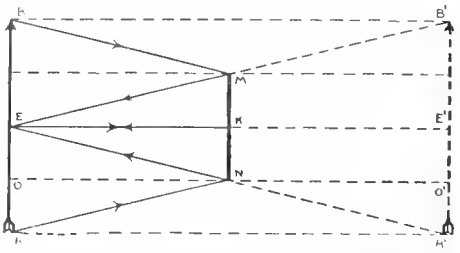


Fig. 5. The above illustration graphically shows why it is impossible to obtain an image from a plain mirror which will be larger than twice the size of the mirror.

Since no assumption has been made regarding the distance of the observer, it is evident that the portion of the image that is visible is the same for all distances.

In Fig. 6 we show why the object appears larger in a mirror as the eye is further from the mirror than when viewed closely to the mirror. It will be seen that the comparison is automatically made with the borders of mirror MN. Let us assume that we have an object AB. Now, according to the laws of plain mirrors, the image of AB will be real, erect and as far in back of the mirror as the object is in the front of it; or, in other words, the virtual image will be at A^1 and B^1. As the eye observes the image A^1 B^1 of object AB at E, a small portion of the mirror CD will serve to reflect the various waves of light coming from object AB. But if the eyes are at E^1, the portion of the mirror which serves to reflect the rays of light is C^1 D^1. This portion is considerably greater and as we recede from the mirror C^1 D^1 becomes larger and, consequently, the object AB is apparently enlarged, although actually the image is always in the same position.

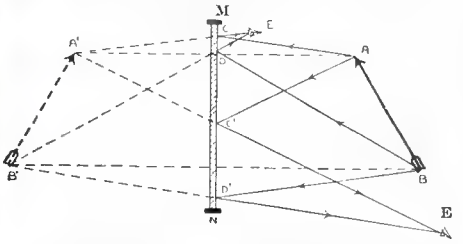


Fig. 6. The diagram indicates why it is that an object appears larger when viewed in a mirror if the eye is further from the mirror than when close to it.

This Tenor Banjo FREE

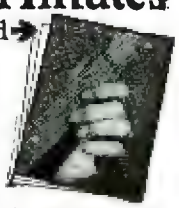
WHEN YOU ENROLL

This handsome full size, professional tenor banjo is yours. We want to make one thousand new friends this month. We want to present one of these wonderful delightful instruments as a gift to each of one thousand readers of this magazine—and here's why.

Before becoming a professor and a lover of music, particularly the tenor banjo, Prof. Six yearned and yearned for the possession of a genuine, professional instrument, the same kind used by the big, successful professionals of the world. Now we want you to succeed. We want to help every music-lover that we can, attain success, and this gift offer is made to pave the way for you, and no previous musical knowledge is necessary.

We have another surprise for you! Not only do we start you on the way to popularity, success and fame by supplying you with an instrument that you can compare to any used or displayed in your town, but under personal supervision you will be given, by mail, the benefit of the professor's twenty-two years' experience as director of Glee and Instrumental clubs of New York University (his name is Harry S. Six). We don't just send you a lot of printed words and instructions and trust to luck that you will catch on. The professor's method is different and has proven to be the simplest devised by man—that is why we claim you'll be able to play in thirty minutes. Put us to the test.

Learn in 30 Minutes With My Picture Method



Arthur Brisbane, the highest paid journalist in the world, once said that "a single picture is worth a thousand words." He was right, for it stands to reason, when you take your instrument in hand along with the actual photographs of the professor in action as your guide, it is easy to imitate and do the right thing. But that is not all.

Phonographic Records Given

We also furnish as an additional guide, phonographic records of the professor's playing of the piece you are learning, along with our thorough, printed and illustrated, easy-to-read course. Doesn't that sound easy? It is easy. If you could sit here and see the letters and telegrams from our pupils, you would be convinced that we have perfected the simplest, yet most highly efficient course to insure you mastering the tenor banjo.

Don't Send a Single Cent

Investigate offer today. Don't put off until tomorrow because you might forget and miss this wonderful opportunity. It might be the turning point in your career. Don't send a single cent. Just drop a line—use coupon or postal card will do—telling you are interested in receiving full particulars about course and to reserve one regular eighteen dollar, full size professional tenor banjo for you, which is offered as a gift.

Act quickly, because there may not be enough gift banjos to go around for the million or more readers of this magazine. This does not obligate you in any way. Therefore do not hesitate—put in your reservation now, this very minute. You will soon join our happy army of enthusiastic finished tenor banjo musicians.

EARN BIG MONEY
HUNDREDS HAVE STARTED ORCHESTRAS AND ARE MAKING BIG MONEY

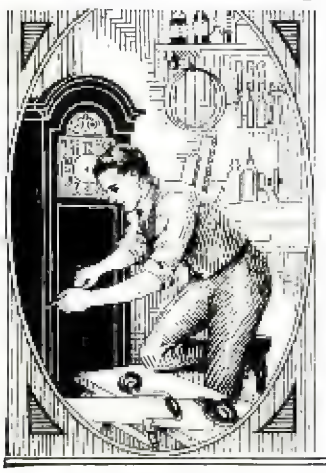
FREE BANJO COUPON
New York Academy of Music
Studio 411 100 Fifth Ave., N. Y.

Please rush all free information relative to your Tenor Banjo Course and reserve a gift tenor banjo for me. This obligates me in no way whatever.

Name .....
Address .....
City ..... State .....

Insure your copy reaching you each month. Subscribe to Science and Invention—$2.50 a year. Experimenter Publishing Co., 230 Fifth Ave., N. Y.

BUILD YOUR OWN GRANDFATHER'S CLOCK



We furnish instructions, plans and specifications, and sell you the clock works as low as $5.00 and up to $250.00. Westminster and Whittington Chimes that play every quarter hour and a wide variety of dials and movements. Improve your spare time by making good, sure profits. There is always a good market for Grandfather Clocks.

GET OUR CATALOG OF DIALS, WORKS, PRICES AND INSTRUCTIONS

American Chime Clock Company
1679-B RUFFNER STREET PHILADELPHIA, PA.

www.americanradiohistory.com

Try this!

Save Big

You Can Now, for the First Time, *Order Three Different Magazines SENT TO THREE DIFFERENT ADDRESSES* and Still Get the Very

Lowest Wholesale Prices on Best Magazines!

THIS is News! Big news for magazine readers of all classes! By special arrangement with a number of publications, we are able to offer you **wholesale** prices on the best of the standard magazines. Buy your magazines **now** under this great offer and you will save half or more than half the price at the single copy or newsstand rate. And you will save almost half in nearly every instance over the regular yearly subscripton rates. Furthermore, we shall be glad to send each magazine to a different address if you direct, or all to one, as you wish.

Never Before Such An Offer!

Never before have magazine clubs been offered in this way. Always heretofore all magazines in the club had to be sent to one person. We have changed all that! You can now have all the magazines sent to yourself, or only one or two to yourself and the other ones to different persons.

Go In With Your Neighbors

Show this offer to your friends, relatives or neighbors. Give them the advantage of wholesale price on their favorite magazine! For instance, you'd like "Radio News," one friend wants to renew his subscription for six months to "Review of Reviews," and another one would like "Illustrated Monthly." Separately the price would be $6.00; but you can buy them now for only $2.99! Less than half!

Every Magazine for a Full Year

Every magazine (except two) subscription will be for one full year. "French Humor" will be 26 issues or six months. And "Review of Reviews" may be had for six months if full year is not desired. If subscriber is already taking any magazine and present subscription is not yet expired, mark that name with an X on the coupon order and subscription will be added on to present one.

Three Excellent Xmas Presents

What would please friends and relatives more—What would remind them of your thoughtfulness so many times during the year, as a subscription to a nice magazine! What three presents could you buy for so little money that would look so big? A dollar or so apiece wouldn't buy much of a gift, but think what it buys here. If you will mark "Xmas" on the Coupon Order we will send the first copy of each magazine to reach the name given just before Christmas and will also send a beautifully engraved Christmas Card announcing it as your gift.

How to Order—Read Carefully

Before the name of each magazine is a number. Order by number only. If you want "Radio News," "Illustrated Monthly" and "Success" sent to you, order numbers 1, 2 and 29. If you want "French Humor" (26 issues) and "Illustrated Monthly" and "Success" order 5, 2 and 29. If you want these three sent to three addresses, indicate by number which magazine is to be sent to the respective name. Be sure to send order coupon properly filled out and don't fail to enclose remittance—your check will be acceptable. Order NOW. We will be rushed later. Get in early and get quick service.

CONSRAD CO., 230 Fifth Ave., New York

References: Equitable Trust Co., New York City; Experimenter Publishing Co., or the publisher of any of the magazines quoted.

GIVE THEM FOR CHRISTMAS!

www.americanradiohistory.com

Money on Quality Magazines

SELECT FROM BARGAINS BELOW:

All Magazines Are for One Year Each, Unless Otherwise Mentioned. Order at Once.

THESE PRICES NOT GOOD IN CANADA NOR ELSEWHERE OUTSIDE UNITED STATES

You get the pair of magazines listed in each column heading plus any one magazine below. Order by reference number shown in brackets in front of each magazine.	(1) RADIO NEWS (2) Illustrated Monthly and any magazine below.		(3) AMAZING STORIES (2) Illustrated Monthly and any magazine below.		(4) SCIENCE & INVENTION (2) Illustrated Monthly and any magazine below.		(5) FRENCH HUMOR-6 mo. (2) Illustrated Monthly and any magazine below.	
	REGULAR	OUR PRICE	REGULAR	OUR PRICE	REGULAR	OUR PRICE	REGULAR	OUR PRICE
(6) American Boy	$6.00	**$3.99**	$6.00	**$3.99**	$6.00	**$3.99**	$5.50	**$3.69**
(7) American Magazine	6.50	**5.01**	6.50	**5.01**	6.50	**5.01**	6.00	**4.51**
(8) Better Homes & Gardens	4.60	**2.79**	4.60	**2.79**	4.60	**2.79**	4.10	**2.49**
(9) Boy's Life	6.00	**3.76**	6.00	**3.76**	6.00	**3.76**	5.50	**3.39**
(10) College Humor	7.00	**4.16**	7.00	**4.16**	7.00	**4.16**	6.50	**3.89**
(11) Collier's Weekly	6.00	**4.66**	6.00	**4.66**	6.00	**4.66**	5.50	**4.39**
(12) Cosmopolitan	7.00	**5.01**	7.00	**5.01**	7.00	**5.01**	6.50	**4.69**
(14) Delineator	7.00	**4.98**	7.00	**4.98**	7.00	**4.98**	6.50	**4.69**
(15) Etude	6.00	**4.01**	6.00	**4.01**	6.00	**4.01**	5.50	**3.66**
(16) Everybody's Magazine	6.50	**4.28**	6.50	**4.28**	6.50	**4.28**	6.00	**4.09**
(17) Golden Book	7.00	**4.01**	7.00	**4.01**	7.00	**4.01**	6.50	**3.69**
(18) Good Housekeeping	7.00	**5.01**	7.00	**5.01**	7.00	**5.01**	6.50	**4.73**
(19) Hunting & Fishing	4.50	**2.98**	4.50	**2.98**	4.50	**2.98**	4.00	**2.62**
(20) McCall's Magazine	5.00	**3.14**	5.00	**3.14**	5.00	**3.14**	4.50	**2.86**
(21) Modern Priscilla	6.00	**3.56**	6.00	**3.56**	6.00	**3.56**	5.50	**3.29**
(22) Motion Picture Magazine	6.50	**4.48**	6.50	**4.48**	6.50	**4.48**	6.00	**4.19**
(23) Open Road for Boys	5.00	**2.69**	5.00	**2.69**	5.00	**2.69**	4.50	**2.46**
(24) People's Home Journal	4.50	**2.71**	4.50	**2.71**	4.50	**2.71**	4.00	**2.48**
(25) Pictorial Review	5.50	**3.75**	5.50	**3.75**	5.50	**3.75**	5.00	**3.54**
(26) Review of Reviews	8.00	**4.98**	8.00	**4.98**	8.00	**4.98**	7.50	**4.76**
(27) Rev. of Reviews (6 mo.)	6.00	**2.99**	6.00	**2.99**	6.00	**2.99**	5.50	**2.74**
(28) Screenland	6.50	**3.48**	6.50	**3.48**	6.50	**3.48**	6.00	**3.29**
(29) Success Magazine	6.50	**3.79**	6.50	**3.79**	6.50	**3.79**	6.00	**3.58**
(30) Woman's Home Comp'n.	5.00	**3.49**	5.00	**3.49**	5.00	**3.49**	4.50	**3.31**
(31) Youth's Companion	6.00	**3.69**	6.00	**3.69**	6.00	**3.69**	5.50	**3.47**

Special Combinations

Or you can have either of the four pairs of magazines given in column headings plus these:	REGULAR	OUR PRICE
(29) Success and (12) Cosmopolitan	$9.50	**$6.01**
(23) Open Road for Boys, (19) Hunting and Fishing, (8) Better Homes and Gardens	6.60	**3.65**
(20) McCall's, (8) Better Homes and Gardens, and (24) People's Home Journal	6.10	**3.49**
(28) Screenland, (10) College Humor, and (20) McCall's	10.50	**5.99**
(32) Popular Science and (33) Scientific American	10.00	**7.49**
(34) Woman's World, (8) Better Homes and Gardens, (24) People's Home Journal and (35) Needlecraft	6.10	**3.69**

Please be careful to mention numbers. We positively will not break combinations.

These offers not good in Canada or elsewhere outside the U. S.

SPECIAL OFFER COUPON!

Please Cut Out Along Broken Lines and Mail This Coupon with Remittance.

CONSRAD CO., Dept. S, 230 Fifth Ave., New York City.

I enclose $..... for following subscriptions:

Send Magazine No.....to

.....

.....

Send Magazine No.....to

.....

.....

Send Magazine No.....to

.....

.....

Send Magazine No.....to

.....

.....

Send me Magazine No.....

My Name.....

Address .....

www.americanradiohistory.com

5 Big Helps for Electrical Workers

THIS library outlines the practical remedies that have been applied by repairmen all over the country in the solving of puzzling electrical problems. Everything the expert knows about maintenance and repair is given in the books. They prepare you for the big job—they make you well worth the big pay that goes with it.

ELECTRICAL MAINTENANCE AND REPAIR *5 vols. Library Binding*

These books cover every phase of electrical maintenance and repair work, from armature winding to the correction of brush troubles. They include many things never before assembled in book form.

They not only tell you what to do in the case of electrical trouble, but they show you how to do it. And when it's done it will be done right! The methods outlined for you by the authors of these books have all been thoroughly tested in actual practice.

Over 1700 pages—more than 1500 illustrations and diagrams.

FREE TRIAL

7 Months to Pay!

Fill in and mail the coupon attached and we will send you, free of all cost or obligation, the entire set of five volumes for 10 days' examination.

McGraw-Hill Book Co., Inc.,
370 Seventh Avenue, New York.

Gentlemen:—Send me the LIBRARY OF ELECTRICAL MAINTENANCE AND REPAIR all charges prepaid for 10 days' Free Examination. If satisfactory I will send $2 in ten days and $2 a month until $14 has been paid. If not wanted I will return at your expense.

Name .....
Home Address .....
City and State .....
Firm or Employer .....
Occupation SI-11-27

Mount Birds

Learn at Home by Mail Be a taxidermist. Learn to mount BIRDS, ANIMALS, GAME HEADS, FISH. Wonderful fascinating new art. All secrets revealed. Easily, quickly learned by men, women and boys. Decorate home and den with nature's finest art. SPORTSMEN save your trophies. BIG PROFITS for spare time. Sell your mounted specimens and mount for others. Have a business of your own. Big demand, high prices. Learn from old reliable school, 20 years' experience.

FREE! Beautiful illustrated book, "How to Learn to Mount Game", with dozens of photos of mounted specimens. Yours for the asking — FREE — Write Today. Taxidermy is a NECESSITY for sportsmen and nature lovers — INVESTIGATE. Get this wonderful FREE BOOK NOW — no obligations. Write! Don't delay. Send Coupon Today—NOW!

FREE BOOK COUPON

N. W. School of Taxidermy
3798 Elwood Bldg., Omaha, Neb.
Send me your free illustrated book "How to Mount Game." Also tell me how I may learn this fascinating art easily and quickly by mail. No obligation.

Name .....
Address .....

GOV'T POSITIONS

$35 TO $75 WEEKLY

( ) Railway Mail Clerk	( ) Meat Inspector
( ) P. O. Clerk	( ) Special Agent (Investigator)
( ) Forest Ranger	
( ) File Clerk	( ) Stenographer-Typist
( ) Matron	( ) Immigrant Inspector
( ) General Clerk	( ) City Mail Carrier
( ) Chauffeur-Carrier	( ) U. S. Border Patrol
( ) Skilled Laborer	( ) Typist
( ) Watchman	( ) Seamstress
( ) Postmaster	( ) Steno-Secretary
( ) RFD Carrier	( ) Auditor

Mr. Ozment, Dept. 383, St. Louis, Mo
Send me particulars about positions marked "X"—salaries, locations, opportunities, etc.

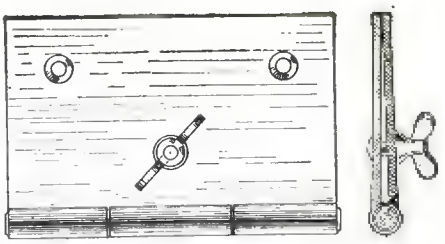
NAME .....
ADDRESS .....

Insure your copy reaching you each month. Subscribe to SCIENCE AND INVENTION—$2.50 a year. Experimenter Publishing Co., Inc., 230 Fifth Avenue, New York City.

Hints for the Mechanic

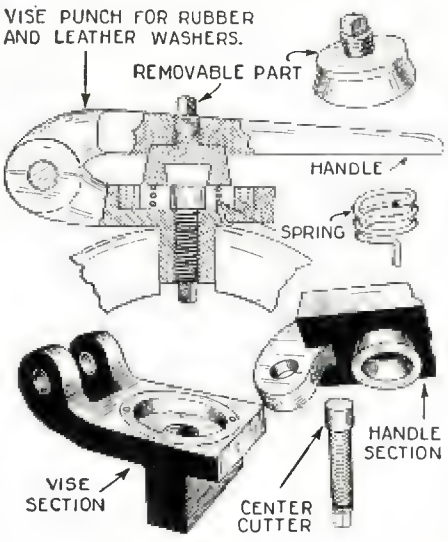
(*Continued from page* 617)

HINGE VISE



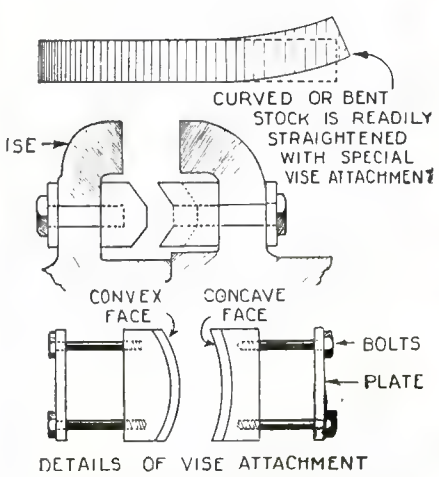
A novel method of making a small vise has recently come to our notice in the German magazine, "Technik Fur Jedermann." We are reproducing the illustration herewith for the benefit of the home mechanic. As may be seen, the device has been made from a hinge, preferably one which has mounting holes. A thumbscrew is passed through the center hole and thus the pressure upon the article in the vise may be regulated.

VISE PUNCH



Leather and rubber washers may be made in various sizes by using the vise punch which is clearly shown in the above sketch. A small coil spring is used for ejecting the washer. —G. A. Luers.

VISE ACCESSORIES



DETAILS OF VISE ATTACHMENT

The above sketch shows clearly the details of a vise accessory which can be used for straightening tools or stock metal. The straightener itself consists of two jaws which are secured to the vise.—G. A. Luers.

Modern Air-Craft

THE AGE OF AVIATION —IS HERE—

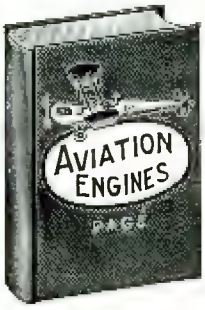
Learn Design, Construction, Operation and Maintenance

Contents of each chapter—I. Aircraft Types. II. Lighter-than-Air Craft. III. Early Airplane Designs. General Design Considerations. IV. Design and Construction of Aerofoils. V. Arrangement, Fabrication and Bracing of Airplane Wings. VI. Airplane Fuselage and Landing Gear Construction. VII. Airplane Power Plant Types and Installation. VIII. Aviation Engine Design and Construction. Air-cooled Engines. IX. Aviation Engine Design and Construction. Water-Cooled Engines. X. Aviation Engine Auxiliaries. XI. Aircraft Propeller Construction and Action. XII. Airplane Equilibrium and Control Principles. XIII. Uncrating, Setting Up and Aligning Airplane. XIV. Inspection and Maintenance of Airplanes and Engines. XV. Details of Modern Airships and Airplanes. XVI. Seaplanes, Flying Boats, Amphibians and Other Aircraft. XVII. Some Aspects of Commercial Aviation. XVIII. Aircraft Instruments and Aerial Navigation. XIX. Standard Nomenclature for Aeronautics, Report No. 240, Part I.

This book is written in simple, understandable language.

700 Pages : 500 Illustrations

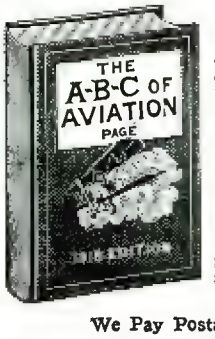
Price, $5.00



AVIATION ENGINES

This book describes the basic principles of aviation, tells how a balloon, or dirigible is made and why it floats in the air. Describes how an airplane flies. It shows in detail the different parts of an airplane, what they are and what they do. Describes all types of airplanes and how they differ in construction; as well as detailing the advantages and disadvantages of different types of aircraft. It includes a complete dictionary of aviation terms and clear drawings of leading airplanes.

274 Pages. Price, $1.25



A. B. C. OF AVIATION

This treatise, written by a recognized authority on all of the practical aspects of internal combustion engine construction, maintenance and repair, fills the need as no other book does. The matter is logically arranged; all descriptive matter is simply expressed and copiously illustrated, so that anyone can understand airplane engine operation and repair even if without previous mechanical training. This work is invaluable for anyone desiring to become an aviator or aviation mechanician.

Price. $1.25

We Pay Postage on All Books

CONSRAD COMPANY, Inc.

230 Fifth Avenue New York

www.americanradiohistory.com

MONEY-MAKING OPPORTUNITIES

TAILORING SALESMEN make real money selling Davis virgin wool, made-to-measure suits. Low-priced, perfect-fitting, guaranteed. Beautiful fabrics. New merchandising plan doubles sales. Liberal bonuses, cash prizes. Write now. P. H. Davis Tailoring Co., Station 30, Cincinnati, Ohio.

Photo Medallion Agents Earn $20 Daily. Easy work collecting photos. Capital or experience unnecessary. Give you 4-day service on beautiful photo reproductions. Write Pudlin, Dept. 116, 259 Bowery, New York.

No Matter What You Are Selling, spare or full time, you can make big, easy, extra daily profits. Every man a customer for Motortex—the new heavy, warm, all wool tailored, dressy, serviceable suit. Worth $35.00. Sells at $19.95. Pays you $3.00 and $4.00 commissions. 37 features. Spotproof and dirtproof. No competition. Write for free outfit. Harrison Bros., Dept. 558, 133 W. 21st St., New York.

Agents—$13.80 Daily (in advance) Spare time will do; introduce 12 months' guaranteed hosiery; 57 styles, 39 colors, for men, women, children. "Silk to the Top" ladies' hose—men's fancies. No capital or experience needed. We furnish samples. Silk hose for your own use free. New Plan. Macochee Hosiery Co., Road 92811, Cincinnati, Ohio.

Agents—90c An Hour Earned Advertising and distributing samples to consumer. Write quick for territory and particulars. American Products Co., 9465 Monmouth, Cincinnati, O.

500 Men Wanted to earn $90 Weekly. Wonderful new line men's suits. Amazing values $9.95 up. Rizaldi averages $4 hourly. We train you. No experience or capital needed. Write Comer Mfg. Co., Dept. TS-4, Dayton, Ohio.

Agents: Amazing new 3-in-1 lingerie combination for women making sensational hit. $15.00 daily easy. Spare or full time. Free Outfit. French Fashion Company, Dept. R-100, 9 North Franklin, Chicago, Ill.

Make $100 weekly selling better-quality all-wool made-to-measure suits and overcoats. Highest commissions. Extra bonus for producers. Large swatch samples free. W. Z. Gibson, Inc., 157 W. Harrison, Chicago.

Salesmen: Write Your Name and Address on postal and mail to us. We'll show you sure earnings of $20 a day. Will you risk one minute and a one cent stamp against $20? Mind you, we say we'll show you. Address Sales-manager, 850 W. Adams, Dept. 619, Chicago.

EARN $87-$110 WEEKLY SELLING CHRISTMAS CARDS. Full or spare time. $10 sample book FREE. Weekly payment. Experience unnecessary. We co-operate. John Hertel Co., 320 Washington, Chicago, Ill.

WANT $500? Sell Beautiful Dresses, Coats, Scarfs, Sweaters. Amazing low prices. We deliver. Exp. unnecessary. Complete outfit free! Write Hirshey Knitting Mills, 2001 South California Avenue, Chicago.

MAKE BIG MONEY HANDING OUT MYSTIC "ZIPPO" Red Hot 50c Household Seller! New Amazing Discovery! Quick Demonstration Brings Immediate Cash Profits for Agents! Write "ZIPPO" Co., Fort Wayne, Ind.

Sensational New Adjustable Cap fits everybody. Sells at sight. Make $50 to $75 weekly writing orders. Commissions in advance. Complete outfit Free. Fits-U Cap Co., Dept. M-105, Cincinnati, Ohio.

I Will Pay You $2 An Hour to take orders for Carlton dresses and coats. Women in every home, store, factory and office eager to save a third on our stunning Paris styles. Everything supplied Free but only applications stating territory, experience and references will be considered. Carlton, Inc., 206 South Wabash, Dept. 332-B, Chicago.

Windows washed in 10 seconds without pail, sponge or brush. A fast $1.95 seller. 90% profit. Agents make $70-$110 weekly. Easy work. Write Wonder Washer, Dept. SM3, 33 East 10th St., New York.

Make $25.00 daily selling colored Rain-coats and Slickers. Red, Blue, Green, etc. $2.95. Hat Free. Commissions daily. Outfit Free. Elliot Bradley, 241 Van Buren, Dept. 10-AF, Chicago, Illinois.

Men—join hundreds others making $20 daily with famous Nogar $12.50 suits. Tremendous advertising support. Astounding wear demonstration makes quick sales certain. Free kit. Write today. Nogar Clothing Mfg. Co., 48 Fourth St., Reading, Pa.

Own your own business. Inexperienced workers, spare time or full time, build profitable business with our new plan. Show marvelous line of actual shoes. Men's, women's and children's. Also durable silk hosiery. We start you by furnishing $40 sample outfit. Patented measurement system insures perfect fit. Every day pay day. If you want a permanent business, send for free book "Getting Ahead." Write now. Tanners Shoe Manufacturing Co., 1111 C Street, Boston, Mass.

New lines just out. Everything in hosiery, underwear and Rayon lingerie for men, women, children. Beautiful, irresistible Catalog and Samples now ready. New special big money plans. Cash bonus, service awards, rapid promotion. No capital needed. Choice territories going. Rush reply to World's Star Knitting Co., 789 Lake St., Bay City, Mich.

Follow a Straight-Line —and WIN!

Do you need more money to enjoy Life? Would you like to own your own home? When do you think you'll buy that new automobile?

If you really *want* to succeed, you must *try*. This may be your lucky day. Find the right opportunities and enjoy prosperity.

You don't need experience. You don't need capital. You can even hold your regular job, doing this pleasant work in spare time.

But you must get started sometime. If you want to succeed, choose the companies that appeal to you. Please don't write unless you mean business.

To the Public: These firms offer you merchandise values, a convenient service that you cannot duplicate elsewhere.

To Manufacturers: For advertising rates, address Publishers Classified Service, 9 East 46th St., New York.

Women Representatives Wanted. New invention prevents shoulder straps slipping. No more discomfort. Women adore it. Write for particulars, free offer. Lingerie "V" Company, 5 Lake St., North Windham, Conn.

New Vest Pocket Adding Machine selling like wildfire. Hundreds of agents making $18.00 a day. Write or wire for sample and territory. M. Cleary, Reliable Adding Machine Co., 170 W. Washington St., Chicago. (Not an ordinary offer.)

Pay Day Every Day! Every Man can use a new suit or overcoat. You can make big money selling All Wool New York tailored styles priced at $19.75, $24.75, $29.75, $34.75. Leatherette case with all wool patterns and actual photographs free. Write today. Harrison Bros.; Dept. 858, 133 W. 21st St., New York.

$100 WEEKLY REPRESENTING: LARGE SHIRT company—direct to wearer—wonderful opportunity for financial independence. Big commissions—easy to take orders—we start you with a sales-compelling outfit free. Write at once. Supreme Shirt Co., Desk M106, 276 Fifth Ave., New York.

America's Greatest Tailoring Line Free! 130 large Swatch Samples—All Wool—Tailored to Order—Union Made—Sensational low price. Get outfit at once. Address Dept. 234, Goodwear, 844 W. Adams, Chicago.

$20 daily easy selling amazing rain-proof caps. Made-to-measure. Finest fabrics and styles. Big advance profits. Free outfit and free cap offer. Taylor Cap Manufacturers, Dept. B-51, Cincinnati, Ohio.

$100 WEEKLY IN ADVANCE. NEW Line $50.00. Tweed Suits $24.00. Genuine All Virgin Wool. Fit guaranteed. Nothing like them in America. Big samples free. Manager, 44 North Ada; Chicago, Ill.

Big Steady Earnings, $35-$100 Weekly assured reliable energetic men and women selling famous Watkins Products. Millions of users everywhere. Write for our surprising new plan. Watkins, CS-3, Winona, Minn.

Agents, distributors—over 100% profit selling Auto Tow Line—strongest, lightest on market. Retails $2.00. Sample $1 postpaid. Less in quantities. Special offer and amazing new selling plan FREE. Wilman Co., Dept. N-65, Toledo, Ohio.

FREE! To honest men over 18: new patented cigarette lighter. Show your friends and make $90 weekly. Send 25c to cover mailing costs and mention name of this magazine. E. Z. Lighter, Dept. 2-G, 15 Westminster Road, Brooklyn, N. Y.

Earn $80 weekly taking orders for charming Fashion Frocks for women and children. Factory prices. Advance commissions. No experience necessary. Fashion Frocks, Inc., Dept. J-100, Cincinnati, Ohio.

Free Book Showing Hundreds, Best Sell-ers from all parts of world, at Wholesale Prices. Agents making $100 weekly. Sporss Importing Co., Lesueur Center, Minn.

Large Manufacturer Wants Agents to sell, to wearer, world's greatest shirt values. Experience unnecessary. Big commissions paid daily. $100 weekly. Extra bonuses and profit-sharing. Samples free. Carlton Mills, 114 Fifth Ave., Dept. 348-S; New York.

Christmas Novelty. Every Store, office and home a prospect. Sold day or evening. Plan now to make $25.00 daily, upward, during December. Cash sales—no order taking. Sample and literature Free. Consolidated, 65-Z Van Buren, Chicago.

75 miles on 1 gallon. New moisture humidifier and Gas Saver. All cars. Agencies wanted everywhere. 400% Profits. 1 Free to introduce. Critchlow, A-374, Wheaton, Ill.

Cap Salesmen—Write for Big Money-Making proposition calling on retail stores. The L. B. Cap Company, 804-806-808 Sycamore Street, Cincinnati, Ohio.

Great neckwear line now free! Features finest quality neckwear at factory prices. Collect big commissions daily. Write for FREE tie offer and FREE outfit. Nawco Neckwear, Desk 11-Z, Covington, Ky.

Bankrupt and Rummage Sales. Make $50 daily. We start you, furnishing everything. Permanent business. Free details. Distributors, Dept. 279, 429 W. Superior, Chicago.

Current Ideas Magazine. How to Make Ideas Popular. Scientific articles. At your newsdealer or send 25c stamps or coin. Current Ideas, 420 Lexington, New York.

Send 25 Cents for a $1.00 Pocket Cigar Lighter and learn how to make $10.00 a day Easy. Sells on sight. Particulars FREE. Rapid Manufacturing Co., 799C Broadway, New York.

BIG PAY EVERY DAY! Complete guar-anteed line direct to wearer. Dress Shirts, Work Shirts, Flannels, Overalls, Pants, Leather Coats, Sweaters, Playsuits. $10-$25 daily! Experience unnecessary. Big Outfit FREE! Nimrod Co., Dept. 58, 4922-28 Lincoln Ave., Chicago.

Extra Pants Free With $15.00 Suits, Up-to-date Patterns. Agents make $3.00 in advance. Write Free Samples. Universal Tailors, 640 Broadway, New York.

We Start You Without a Dollar, Soaps, Extracts, Perfumes, Toilet Goods, experience unnecessary. Carnation Company, Dept. 593, St. Louis, Mo.

AGENTS MAKE $3.00 HOUR TAKING orders for 40 fascinating "Handy Things" for Kitchen. Sell on sight! Write General Prod. Co., Dept. SM-3, Newark, N. J.

Will you wear a pair of genuine tailor-made shoes at my expense? Will you show them to your friends and take their orders? I will ALSO send you FREE our big selling Outfit showing 70 shoe styles and 60 actual leather samples. I pay my agents $8.00 daily. Write quick. Tailor-Made Shoe System, 932 Wrightwood, Dept. 10-A, Chicago, Ill.

Salesmen—Just Out, $8.88 for Men's suits; commission $3 in advance; free selling kit. The 888 Company, Dept. 7, Fort Wayne, Ind.

KNOWLEDGE IS POWER!

Learn While You Earn!

Electricity Made Amazingly Easy! Learn in 12 weeks on actual Electrical Machinery in great School of Coyne. Not by correspondence. No books—no lessons. Employment Service for life after graduation. Get the facts. Send for big free book today. Coyne Electrical School, Dept. 87-75, 500 South Paulina St., Chicago, Ill.

Be a Hotel Hostess, Opportunities Every-where, fashionable hotels, clubs, apartments. Fascinating profession; previous experience unnecessary. Simplified home-study plan qualifies you for well-paid position. We put you in touch with positions. Write today. Lewis Hotel Training Schools, Sta. AM-W661, Washington, D.C.

HIGH-SALARIED POSITIONS waiting for you in automobile, tractor and airplane work. I'll train you in eight short weeks so you can earn $45.00 to $75.00 a week — unlimited future for good men. Qualify as an expert and own your own garage or service station. Write me TODAY for big FREE AUTO BOOK. Your Railroad fare included in this big special offer. The opportunity of a lifetime — don't miss it by delay. J. H. McSweeny, The Auto Man, Address, X300—654 E. McMillan, Cincinnati, or X300 — 1815 E. 24th St., Cleveland, Ohio. Please mention this magazine.

Steamship Positions—Men—Women, Good pay. See the world Free. Experience unnecessary. Send self addressed envelope for list. Drawer 122, Mount Vernon, N. Y.

Men, get Forest Ranger job; $125-$200 month. Home furnished; hunt, fish, trap on side; permanent, no strikes or shut-downs; full pay vacations. For details, write Norton, 270 McMann Bldg., Denver, Colo.

The greatest book on money making stunts that has ever been published will be mailed to you if you will send us 15c in cash or stamps. There are over 50 up-to-date workable plans. Address SPARETIME MONEY MAKING, 230 Fifth Avenue, New York City.

U. S. Govt. wants men. $1,900-$2,700 at start. Railway Postal Clerk exams. coming. Our former government examiner prepares you for this and other branches. Free booklet. Dept. 269, Patterson School, Rochester, N. Y.

Earn $25 Weekly. Spare Time, Writing for Newspapers, Magazines; exp. unnecessary. Copyright Book "How to Write for Pay" Free! 1307 Press Syndicate, St. Louis, Mo.

All Men—Women, 18-50, Wanting to qualify for Forest Ranger, Ry. Mail Clerk, Special Agent, and other Govt. Positions $140-$250 month, write Mr. Ozment, Dept. 137, St. Louis, Mo.

$$$ for Photoplay Plots. Stories revised, copyrighted, marketed. Estab. 1917. Booklet free. Universal Scenario Co., 290 Western & Santa Monica Bldg., Hollywood, Calif.

$158-$225 month. Railway Postal Clerks. Steady work; men 18 up. 25 coached free. Common education sufficient. Write immediately. Franklin Institute, Dept. P-91, Rochester, N.Y.

New Free Book "Modern Salesman-ship." Shows you quick, easy way to make big money selling. Inexperienced men soon become big producers, experienced men double and treble sales. Free Employment service. Write, no obligation. National Salesmen's Tr. Assn., N. S. T. A. Bldg., Dept. S, Chicago.

HELP US AND WIN A FREE PRIZE

Thousands of ambitious folks are studying and profiting by these classified columns each month. Now we want to become better acquainted with our readers. If you will answer these five simple questions, we will send you with absolutely no charge and obligation a nice present.

1. Are you favorably known in your community?
2. What is your occupation?
3. Why do you buy this magazine?
4. Why do you like or dislike this page of "Money-Making Opportunities"?
5. Would you like to make some money for Christmas and a bigger income in 1928?

In appreciation of this favor we will send everybody who answers the above questions a useful valuable souvenir. Please state whether you wish this prize for a lady or a gentleman. Write your answers on any kind of paper. Address Souvenir Manager, P. C. S., Room 703, 9 East 46th St., New York City.

www.americanradiohistory.com

HOME-STUDY COURSES

THAT LEAD TO BUSINESS CAREERS

DO YOU WANT an important, high-salaried position? You can have one if you can do the work. LaSalle experts will show you how, guide you step by step to success and help solve your personal business problems thru the time-saving LaSalle Problem Method. Our *salary-increasing plan* enables you to prepare during your spare hours, without interference with your present duties. Simply mark on the coupon the field in which you desire success, and we will mail you a valuable book describing the opportunities in that field, together with an outline of our *salary-increasing plan*. Also copy of "Ten Years' Promotion in One." There is no cost or obligation. Find out how the *salary-increasing plan* starts average men and women on the high road to success and financial independence. Check and mail the coupon NOW.

Find Yourself Thru LaSalle

LASALLE EXTENSION UNIVERSITY
The World's Largest Business Training Institution

Dept. 11384-R Chicago

I should be glad to learn about your *salary-increasing plan* as applied to my advancement in the business field checked below. Send also copy of "Ten Years' Promotion in One," all without obligation.

- ☐ Business Management
- ☐ Higher Accountancy
- ☐ Traffic Management
- ☐ Modern Salesmanship
- ☐ Railway Station Management
- ☐ Law—Degree of LL.B.
- ☐ Commercial Law
- ☐ Industrial Management
- ☐ Modern Foremanship
- ☐ Personnel Management
- ☐ Banking and Finance
- ☐ Modern Business Correspondence and Practice
- ☐ Expert Bookkeeping
- ☐ C. P. A. Coaching
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ Stenotypy

Name .....

Present Position .....

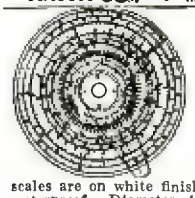
Address .....

RESHAPE your NOSE to beautiful proportions while you sleep

ANITA NOSE ADJUSTER is SAFE, painless, comfortable. Speedy, permanent results guaranteed. Doctors praise it. No metal to harm you. Small cost. Write for FREE BOOKLET

Gold Medal Won 1928

ANITA CO., Dept. M-73, ANITA Bldg., NEWARK, N. J.



THE MIDGET SLIDE RULE instantly adds, subtracts, multiplies, divides, solves proportion, gives all roots and powers. Logarithms, Sines, Cosines, Tangents, Cotangents, Etc. Also gives decimal equivalents, lettered and numbered drill and tap sizes.

More than 110,000 sold, more than 2000 unsolicited testimonials. The Engine-divided scales are on white finished aluminum and are grease and waterproof. Diameter 4". Price with Instruction Book, $1.50. Pocket Carrying Case, 50c extra, Cash or C.O.D. Catalogue free. Your money back if you are not satisfied.

GILSON SLIDE RULE COMPANY. Stuart, Florida

CHEMISTS

Our new catalog listing 5000 Chemicals, 2500 illustrations, Laboratory Apparatus and 1000 books, sent on receipt of 50c.

Laboratory Materials Company
635 East 71st St., Chicago, U.S.A.

MAGIC BOOK 10c

Latest 1927 Edition—100 Pages Profusely illustrated. Over 500 Tricks described and explained. **Reduced Price Catalog** of Magic—Illusions—Escapes—Jokes—Puzzles—Books and European Novelties included. Amaze and Mystify your Friends—it's easy Send 10c today. Lyle Douglas, Station A-3, Dallas, Texas.

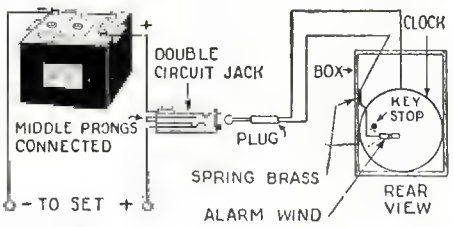
LIVE SALESMAN WANTED

Sell **Cox HoldFast Screw Drivers.** Self holding. Self releasing. For Mechanics, Radio and Auto work. Proposition and sample. Auto size 50c; Radio, 75c.

S. J. Cox. Dept. J. Franklin, Pa.

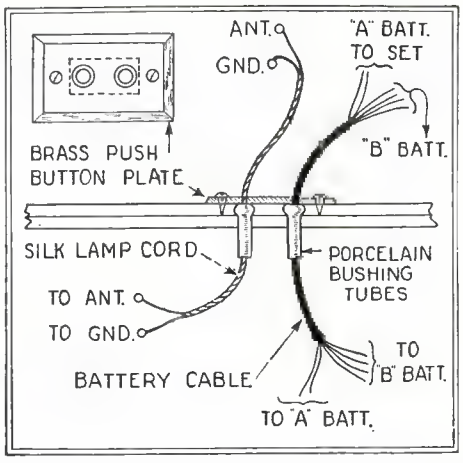
Radio Wrinkles

AUTOMATIC RADIO CONTROL



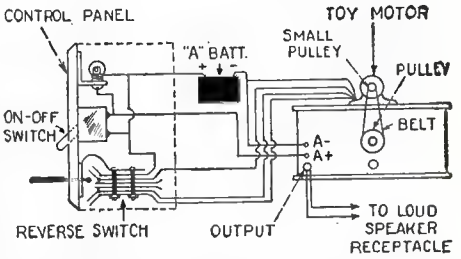
The radio set may be turned on or off automatically by using an arrangement such as that shown above. The middle prongs of the double circuit jack should be connected together. One wire from the plug is soldered to the frame of the clock, the other wire to a piece of spring brass. A double circuit jack is employed to connect the clock in series with the A battery. When the clock is not connected, the current flows through the jack, as the circuit is then closed.—G. E. Valentine.

NEAT RADIO INSTALLATION



A very neat appearing job can be made by following the above suggested radio installation. Two porcelain tubes are put in holes drilled through the floor. The holes are cut larger at the top so that the heads of the tubes drop to a point flush with the inner side of the brass plate. A regular push-button switch plate is used. The plate is secured to the floor with two round head brass screws. The wires leading to the antenna and ground and to the batteries are also prevented from tangling.
—A. E. Anderson.

REMOTE RADIO CONTROL



The above diagram shows a method of remote control which is very easy to install and at the same time is inexpensive. This method is used with the single dial type of receiver. The dial is removed and a small pulley placed on the shaft which in turn is connected to a small toy motor by means of a belt. The control dial is an ordinary wall switch and face plate. The reversing switch, which comes with the motor, is small and is placed at the bottom of the panel. The on and off switch is placed above this. A small bulb is also provided which acts as a pilot light and is connected in such a manner that it will light when the switch is thrown on. With this type of control the radio receiver may be placed in some out of the way place and can be forgotten insofar as the tuning is concerned. It is merely necessary to set the rheostat dials permanently after the set has been installed. A small rheostat should be placed in series with the motor in order to control the speed.—H. R. Wallin.

The 4th and Greatest edition of **RADIO NEWS AMATEURS' HANDIBOOK**

HERE is the greatest Radio Handibook ever published! Right up to date—a brand new edition of the very finest selected articles that have appeared in RADIO NEWS, Radio's Greatest Magazine, this year.

All new Radio—Plenty of latest model circuits with blueprint diagrams, ready for building. This is the most popular Radio Book ever printed. The past three editions were completely sold out.

—And you we offer the biggest and best edition of them all—116 pages of 1927 Radio complete with elaborate circuit diagrams and illustrations and parts. Size 9x12 inches.

Copies are going fast, get your order in now—or see any newsdealer.

50c ON ALL NEWSSTANDS

If your newsdealer cannot supply you use coupon below.

EXPERIMENTER PUBLISHING CO., INC.
230 Fifth Ave., New York

EXPERIMENTER PUB. CO., Inc.
230 5th Ave., New York, N. Y.

Gentlemen: I enclose 50c. for one copy of the new 1927 AMATEURS' HANDIBOOK.

Name .....

Address .....

City, State .....

www.americanradiohistory.com

GASOLINE NOW 11¢

AUTO OWNERS MYSTIFIED BY NEW DEVICE — Public Welcomes News — With 236 SEED AS CREATOR OF Octoperson

NEW INVENTION MAKES THIS POSSIBLE

A mysterious whirlwind device that can be installed in a few minutes on any car makes it possible for cars to run on 7% gas. Already thousands of cars have been equipped and are showing amazing mileage tests on gas. Bona fide reports show up to

60 Miles On a Gallon of Gas

This device not only saves gas but increases power, prevents carbon forming, produces flashy pick-up and quick starting.

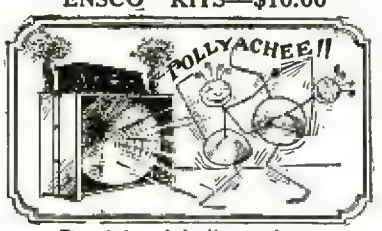
$100 a Week Territory Open

The demand for the Whirlwind is spreading like wildfire. Men are needed everywhere to take care of local business. $100 a week is easily possible. Part time workers can earn $5 an hour. Write today for this splendid opportunity and free sample offer.

Free Sample Is supplied to our workers so they can equip their own cars.

Whirlwind Carburetor Company
999-100E Third St., Milwaukee, Wis.

WORLD'S FINEST
(3 FT. CONE) LOUD SPEAKER
"ENSCO" KITS—$10.00

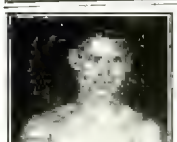


The choice of leading engineers.
Write for booklet on how to make this in less than an hour.
ENGINEERS SERVICE COMPANY
25 Church St., Desk 10 -:- New York

Earn $75 Weekly Building Radio Sets

Join the Association! We train you to build and repair radio sets—start you in business—enable you to earn $3 an hour upwards. **Free 5-Tube Radio Set to Members.** Write for special limited-time plan whereby your membership need not cost you a cent. Write today!

RADIO ASSOCIATION OF AMERICA
Dept. SN-11 4513 Ravenswood Ave. Chicago, Ill.



I Positively Guarantee

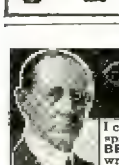
to increase your arms one-half inch in size, chest one full inch, strength 25%, health, 100% in one week's time, by following my instructions and using my exerciser 10 minutes mornings and at night. Send $1 for complete course and exercisers. Satisfaction guaranteed or $1 refunded.

PROF. J. A. DRYER
Box 1850-L Chicago, Ill.

MODEL MAKING

When you have made your Model Boiler, you will naturally wish to mount it with the best Steam Fittings obtainable. We can supply accurately made miniature Steam and Water Gauges, Steam Valves, Pumps, etc., also finished Engines and Boilers suitable for Model boats and stationary purposes. Special work to order. Large illustrated catalog 20c (refunded on first order).

BATHE MFG. CO.
Dept. 2. 5214 Woodland Ave., Phila., Pa.



Learn Write

I can make a good penman of you at home during your spare time. Write for my FREE BOOK, **"HOW TO BECOME A GOOD PENMAN."** Your name elegantly written on a card if you enclose stamp. Write today.
F.W.TAMBLYN, 424 Ridge Bldg., Kansas City, Mo.

You can be quickly cured, if you

STAMMER

Send 10 cents for 288-page book on Stammering and Stuttering, "Its Cause and Cure." It tells how I cured myself after stammering 20 yrs. **B. N. Bog 8146 Bogue Bldg., 1147 N. Ill St., Indianapolis**

FOREST RANGERS

MEN, get Forest Ranger job; $125-200 mo. and home furnished; permanent; hunt, fish, trap. For details, write Norton, 2650, McMann Building, Denver, Colo.

BOOK REVIEW

THE NORTH AMERICAN ALMANAC, 1927 edition, published by the North American Almanac Company, stiff board covers, size 5¼" x 8", 142 pages, numerous illustrations. Price $0.25.

The 7th issue of the North American Almanac has searched all the fields of scientific knowledge and presents articles by authorities, interestingly written with accuracy and scholarly research and profusely illustrated. The ways of telling time by the Ancients, the mysteries of colors, the twelve great American inventors, birds, a study of insect life and many other extremely interesting subjects await one between the covers of the 1927 Almanac. The "Human Interest" calendar of the months is an innovation and marks one of the most interesting improvements in calendars in many decades.

ELECTRIC CONDENSERS, by Philip R. Coursey, B.S., 628 pages, 514 illustrations, stiff cloth covers, size 5¾" x 8½", published by Sir Isaac Pitman & Sons, New York. Price $10.00.

This book contains a complete treatise on the design, construction, and uses of electric condensers both for radio transmission and reception and for power factor correction and other industrial purposes. The fundamental nature of condensers is described in chapter one. In chapter two is given a history of condensers and experiments performed in the early days and so the book goes chapter by chapter and step by step deeper into the mysteries of condensers. Many of the bibliographical references are mentioned in the text of the book, and are referred to therein by number. This collection will doubtlessly be valuable to research workers, and to students of this branch of electrical engineering, as well as to manufacturers and others engaged in the industry. A bibliography containing over 1500 references forms an important feature of the book. The growing demand for condensers of various types emphasises the need for further research and development, and to those engaged in this work this book will especially appeal.

THE TOMB OF TUT-ANKH-AMEN, second volume, by Howard Carter, 400 pages, 153 illustrations stiff cloth covers, size 6" x 8¾", published by George H. Doran Company, New York. Price $5.00.

Mr. Carter continues the story of the tomb of Tut-Ankh-Amen with great detail and deliberation, describing here the work of the second, third and fourth seasons. Neither text nor illustrations have been published before. The dramatic account of a treasure trove of unbelievable splendor holds the reader spellbound. The veil is lifted from before a scene of great beauty and the reader enters a sacred tomb of the ancient Egyptians. It will, no doubt, be remembered from the first volume that the accounts published all over the world describing how, after many years of toil, the searchers at last reached their goal in the discovery of a steep cut in the bed rock beneath the entrance of the tomb of Rameses VI, which proved to be the beginning of a stairway that led down to the tomb of Tut-Ankh-Amen. This second volume gives an account of the remaining work done on the tomb and is well worth the reading.

AN OUTLINE OF CAREERS, by Edward L. Bernays. Stiff cloth covers, 6¼" x 9½", 430 pages. Published by George H. Doran Co., New York City. Price $5.00.

Here is a mighty instructive book for the adolescent, and a dangerous one for the adult. The reason is that it is made up of a number of short summaries of the different lines of business and the professions, prepared by the actual people who have been instrumental in bringing their respective fields of achievement into the front rank of public service. Naturally each of these writers has a deep love for his work—or so it appears in this book—and the most attractive aspects of his daily occupation are accordingly emphasized for the attention of the reader.

Now this is fine for the young man who hasn't decided what he shall take up as a career, but think of the discontent and dissatisfaction it awakens in the breast of our successful man who has been applauding (to himself) his remarkable achievements, only to find them dwarfed and greatly overshadowed by the work of others in obviously pleasanter fields.

Perhaps this is only the working out of that old adage regarding the grass on our neighbor's lawn! The book contains 430 pages, with table in the back showing proportion of women to men engaged in professional commercial pursuits.

Hawaiian Guitar FREE to Students Worth $18

This Hawaiian Guitar expert and professor wants the opportunity to welcome you as a student so you will quickly learn how to play Hawaiian Guitar—yes, you will be able to play just like the native Hawaiians. To get you started and help your musical success which will bring you popularity, you will receive a beautiful Hawaiian Guitar, the same as the one pictured, free when you enroll. Our short cut method of instruction will enable you to play a piece almost from the first lesson. Rush coupon for full particulars today and we will reserve a gift Hawaiian Guitar for you.

Learn to Play Quickly

With our short cut method of instruction you will quickly learn how to play Hawaiian Guitar which will bring you popularity and social success. You learn to play from notes. If you never had any musical training, you will quickly get on, because our nine experts have perfected a course of home instruction which is as simple as learning A, B, C's.

Picture and Phonograph Record Method Easy We don't depend upon printed lessons only for your success, but we furnish pictures of our professors playing, diagrams, charts and phonograph records for each lesson. This practically brings our professors from our studio to your own home and enables you to listen to their playing just as if they were actually in front of you. To prove this is easy, we will send you your first lesson free.

Rush Coupon—Send No Money

So positive are we that you will become one of our students, we will send free without obligation, our first lesson. Also receive our free big book which gives particulars about our course. Write for your free book and your free lesson today.

HAWAIIAN STUDIO No. 5511
of New York Academy of Music
100 Fifth Avenue, New York, N. Y.

Please rush your free book, "How to Learn Hawaiian Guitar" and my first lesson. Also reserve a gift Hawaiian Guitar for me. This obligates me in no way whatever.

Name_____

Address_____

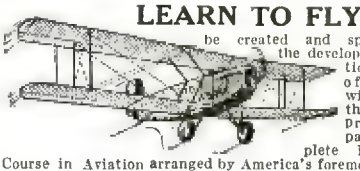
City_____ State_____

WANTED MEN

To Make Metal Toys and Novelties

Big demand for Soldiers, Cowboys, Ashtrays, 5 & 10c Store Novelties, Auto Radiator Ornaments and other all-year sellers. We cooperate in selling goods you make, also buy them from you. Small investment puts you on road to success. WE FURNISH COMPLETE OUTFITS AND START YOU IN WELL PAYING BUSINESS. No experience necessary. ACT QUICKLY if you want to get in BIG CHRISTMAS RUSH and handle wholesale orders now being placed. Write at once for full information.

METAL CAST PRODUCTS CO.
Dept. E, 1696 Boston Road New York



LEARN TO FLY Billions of dollars will be created and spent through the development of aviation. Thousands of positions will be open for those who are Prepared Prepare now! Complete Home Study Course in Aviation arranged by America's foremost aeronautical society. Authentic yet inexpensive. *Write for further information.* **The American Society for Promotion of Aviation, 522 Fifth Ave., Dept. S. I., New York.**

www.americanradiohistory.com

Opportunity Ad-lets

YOU will find many remarkable opportunities and real bargains in these columns. It will pay you to read and investigate the offerings made every month by reliable firms, dealers and amateurs from all over the country. No matter what you may be seeking, whether supplies, automobile accessories, the opportunity to make money, or anything else, you will find listed here the best and most attractive specials of the month.

Advertisements in this section twelve cents a word for each insertion. Name and address must be included at the above rate. Cash should accompany all classified advertisements unless placed by an accredited advertising agency. No advertisement for less than 10 words accepted.

Ten per cent discount for 6 issues, 20 per cent discount for 12 issues. Objectionable or misleading advertisements not accepted. Advertisements for the January issue must reach us not later than November 5.

EXPERIMENTER PUBLISHING CO., INC., 230 Fifth Avenue, New York, N. Y.

Advertisers and Distributors

Earn $8. Distribute 400 free Samples Stopleak Rivets. Send 6c stamps for samples and secure territory. Riveet Co., Cohoes, N. Y.

Advertising Agencies

24 words—355 Rural Weeklies $14.20. Ad-Meyer, 4112-SI Hartford, St. Louis, Mo.

Agents Wanted

We pay $48 a week, furnish auto and expenses to introduce our Soap and Washing Powder. Buss-Beach Company, Dept. A185, Chippewa Falls, Wisc.

100 more active men to introduce Chieftain Guaranteed Tailored Shirts 3 for $4.95. Latest novelties, colors. Dickman, Illinois in 3 weeks made $589; Sinton, Texas in 12 days, $219.60; Bend, Iowa, in 16 days, $334.80. Why not you? No experience or capital needed. We deliver and collect. Full working outfit FREE. Cincinnati Shirt Company, Lane 27011, Cincinnati, Ohio.

New! Amazing "twin" invention! Automatic machine for opening cans: "Magic Groove" sharpener for knives, scissors, tools. Needed everywhere. Big profits. Complete outfit furnished. Write quick for introductory Test Offer. Central States Mfg. Co., Dept. P-951, 4500 Mary Ave., St. Louis, Mo.

Agents: Make $500.00 monthly. Pay daily. No investment. Rhinestone Initial buckles and Novelties. Sell easy everywhere. Exclusive territory. Chaton Novelty Co., 606 Blue Island, Chicago.

Amazing new scientific invention making agents $15-$20 daily; kitchen necessity; dollar seller with big profit; sell two or more every call. Cooking Disc Co., Z163 E. Superior, Chicago.

Big money easily made without peddling or outfits. Free particulars. Elite, 38E Elizabeth St., N. Y.

Agents—We start you in business and help you succeed. No capital or experience needed. Spare or full time. You can earn $50-$100 weekly. Write Madison Company, 566 Broadway, New York.

New Invention—400% profit. Liquid quick mend for fabrics and Hosiery. Stops runs. Every woman buys. Hundred other fast sellers. J. B. Johnson Co., Dept. 858, 6129 Wentworth Ave., Chicago.

Rummage sales make $500.00 monthly. We start you furnishing everything. Experience unnecessary. Monarch, Desk 4, 609 Division, Chicago.

Don't sell for others. Employ agents yourself. Make your own products., Toilet Articles, Household Specialties, etc. 500% profit. We furnish everything and show you how. Valuable booklet free. Write at once. National Scientific Laboratories, 1901W Broad, Richmond, Va.

We want Direct to Consumer salesmen or agents in every community for our Magnetic Trouble Lamp—BRITE-LITE—the fastest selling auto necessity in the world—retails $3. BRITE-LITE sells itself on sight—agents make big money. National sales force now being organized. Here is a chance to join a live organization and have exclusive territory. Send details of your past experience and a BRITE-LITE will be mailed with full information. Address NATIONAL ELECTRIC CORPORATION, P. O. Box 90, Dept. E, Newark, N. J.

Just Out—New Patented Apron. No strings or straps—$20.00 a day every day; over 100% profit; commissions daily. Write for free offer. Sta-Put Co., Dept. 511, St. Louis, Mo.

We Start You—Silvering mirrors; plating tableware, autoparts, headlights, etc.; refinishing metalware, chandeliers, bedsteads, etc. Immense profits. Outfits furnished. WESCO, B-1246, D, Wichita, Kans.

Agents—America's greatest sensation. 6 new record-breaking sellers. Enormous demand; tremendous profits. Write quick for details. United Service, 500 Fifth Ave., New York.

You Are Wanted to Resilver Mirrors at Home. Immense profits plating autoparts, tableware, etc. Write for information. SPRINKLE, Plater, 955, Marion, Indiana.

Salesman Selling to Men: We have side line for you that will sell along with any line you may now be handling and make more money for you, provided you are now selling to men. Get facts at once. Address Salesmanager, 844 West Adams, Dept. 247, Chicago.

We Start You in Business, furnishing everything; men and women, $35.00 to $100.00 weekly operating our "New System Specialty Candy Factories." Few dollars start you home or small room anywhere. Booklet free. W. HILLYER RAGSDALE, Drawer 129, East Orange, N. J.

Radio Agents—Make Big Money—Easy! Selling Marvelous New Sets and Accessories. Buy from factory at lowest prices. Get Big New Catalog with thousands of nationally advertised bargains. FREE Call Book. Write today. American Auto and Radio Co., Dept. 278, Radio Bldg., Kansas City, Mo.

Agents Wanted (continued)

Agents—Best seller; Jem Rubber Repair for tires and tubes; supersedes vulcanization at a saving of over 800 per cent; put it on cold. It vulcanizes itself in two minutes and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 601.

$60—$200 a week. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 441 B., North Clark, Chicago.

Make Money Silvering Mirrors, refinishing auto headlights, tableware, metal plating, bedsteads, chandeliers. Outfits furnished. International Laboratories, Dept. 69, 309 Fifth Ave., New York.

Big money and fast sales. Every owner buys gold initials for his auto. You charge $1.50; make $1.35. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 71, East Orange, N. J.

$50.00 Weekly easy, applying Gold Initials on Automobiles. No experience needed. $1.45 profit every $1.50 Job. Free Samples. "Ralco Monograms", R1043, Washington, Boston, Mass.

Gold Leaf Window Letters & Script Signs. No experience; 500% Profit. Samples free. Consolidated, 69-R-West Van Buren, Chicago.

Succeed With Your Own Products. Make them yourself. Formulas, Processes, Trade-Secrets. All lines. Catalog. Circulars free. D. Thaxly Co., Washington, D. C.

Make $25.00 daily selling colored Raincoats and Slickers, Red, Blue, Green, etc. $2.95—Hat Free. Commissions daily. Outfit FREE. Elliott Bradley, 241 Van Buren, Dept. Ad-11, Chicago.

Airplanes, Aviation

Send dime for 12 inch mounted propeller and circulars on free three foot model aeroplane. No selling. Aero Shop, 3050 Hurlbut Ave., Detroit, Mich.

Biggest, Best Catalog Model Airplanes, Parts, Supplies; 5c postpaid. Ideal Company, 169½ Spring Street, New York.

Airplanes—Send for free cuts and Plans of our wonderful two Place, Companion type, small, high life wing monoplane, and information, How to build this ship, and be sure it will fly, also Propeller literature. Crawford Airplane Manfgr., 2225 American Ave., Long Beach, Calif.

Books

Art and Book Lovers: Send 3 red stamps for our Interesting Valuable Offers. Dr. Lorenzo, 5851 Wentworth Ave., Chicago.

Business Opportunities

Sell By Mail!—Books, novelties, bargains; large profits! Particulars FREE! E-Elfco, 525 South Dearborn, Chicago.

Print 250 Signs or Pictures an hour without press, type or machinery. Sample and particulars 10c. Straco, 1015½, Springfield, Ohio.

Cameras and Photography Supplies

Make money in Photography. Learn quickly at home. Spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 5332, 3601 Michigan Avenue, Chicago.

Chemistry

Your Chemical problems solved and working process furnished for Five Dollars. Write me. W. Stedman Richards, Consulting Chemist, Box 2402, Boston, Mass.

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemist. See our ad on page 582 of this issue. Chemical Institute of New York, 16 E. 30th St., New York City.

Experimenters. Study spectrum analysis. Grating type spectroscopic outfit with wave length scale, and a set of experiments of a type not found in ordinary text, $10.00. Money refunded if not satisfactory. SCIENTIFIC SPECIALTIES CO., Madison, Ind.

Special Offer to Experimenters, 50 different chemicals generous quantities of each. Price $3.50. 25 pieces of chemical apparatus of high quality. Price $3.50. Money order, C. O. D. or cash postpaid. Pines Chemical Co., 1524 St. Marks Ave., Brooklyn, N. Y.

Correspondence Courses

Used correspondence school courses sold on repurchase basis. Also rented and exchanged. Money-back guarantee. Catalog free. (Courses bought). Lee Mountain, Pisgah, Alabama.

Home Study—Engineering, Bookkeeping, Higher Accountancy, High School, and other courses. Write Carnegie College, Rogers, Ohio.

Electricity

Electric Fun! Seventy stunts, 110 volts, $1. Cuttingco, Campbell, Calif.

For Inventors

Inventions Commercialized. Patented or Unpatented. Write Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars (Copyrighted). Write W. T. Greene, 808 Jenifer Bldg., Washington, D. C.

Patents Obtained under cooperative payment plan. Write for particulars. W. E. Beck, Registered Patent Lawyer, 953 Jenifer Bldg., Washington, D. C.

Help Wanted

Men-Women: Make $25.00 daily easy, all or spare time, representing America's foremost Candy Manufacturer. Sell World's Famous Benedetto-Allegretti Chocolates and Bon Bons direct to consumer. Complete Candy store in one elaborate sample case free to producers. Benedetto-Allegretti Co., 36 S. State, Chicago.

Firemen, Brakemen, Baggagemen (white or colored), sleeping car, train porters (colored), $150-$250 monthly. Experience unnecessary. 897 Railway Bureau, East St. Louis, Ill.

Men—Women, 18 Up. Get U. S. Government Life Jobs. $1140 to $3300 year. Steady work. Many Railway Mail Clerks—Clerks—Carriers, appointed every year. Inside and Outside Work. Experience unnecessary. Common education sufficient with our coaching. List positions and full particulars—FREE. Write today sure. Franklin Institute, Dept. R4, Rochester, N. Y.

South American jobs, one dollar for facts and names of employers; just returned over eighteen years Central and South America. Witte, 609 N. 10th St., Reading, Pa.

Men, get Forest Ranger job; $125-$200 mo. and home furnished; permanent; hunt, fish, trap. For details, write Norton, 265 McMann Bldg., Denver, Colo.

Government Forest Rangers, Meat Inspectors, Patrol Guards, Special Agents, Mail Clerks, Chauffeur-Carriers needed often. $125-$250 month. "How to Qualify" mailed free. Write, Ozment, 293, St. Louis, Mo.

Men Wanting Outdoor Work, qualify for forest ranger position. Start $125 month; cabin and vacation; patrol the forests, protect the game; give tourists information. Write Mokane, Dept. M-34, Denver, Colo.

Silvering Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, 16 W. Excelsior Springs, Mo.

Detectives Earn Big Money. Travel. Excellent opportunity. Great demand everywhere. Experience unnecessary. Write, American Detective System, 2190 Broadway, N. Y.

Distributors—No canvassing, no capital. Honery, Roseto, Pa.

Be A Detective. Work home or travel. Experience unnecessary. Particulars free. George Wagner, 2190 Broadway, N. Y.

U. S. Government Jobs. $1140 to $3300 year. Men—women, 18 up. Steady pleasant work. Paid vacation. Short hours. Experience unnecessary. Common education sufficient. List positions and sample coaching with full particulars—FREE. Write today sure. Franklin Institute, Dept. R16, Rochester, N. Y.

How to Entertain

Plays, Musical Comedies and revues, minstrel music, blackface skits, vaudeville acts, monologs, dialogs, recitations, entertainments, music readings, stage handbooks, make-up goods. Big catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 99, Chicago.

Insects Wanted

Cash paid for butterflies, insects. See Sinclair's Advertisement on page 653.

Instruction

Learn Chemistry at Home. Dr. T. O'Conor Sloane, noted educator and scientific authority, will teach you. Our home study correspondence course fits you to take a position as chemists. See our ad on page 582 of this issue. Chemical Institute of New York, 66 W. Broadway, New York City.

Inventions Wanted

Inventions Commercialized. Patented or Unpatented. Write Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Will buy approved invention. Write W. L. Kendig, 416 N. Duke Street, Lancaster, Pa.

Machinery and Tools

Concrete Building Block Machines and Molds. Catalog free. Concrete Machine Co., 5 N. First St., St. Louis, Mo.

www.americanradiohistory.com

Magic and Games

Card tricks. Coin tricks. Hypnotism. Ventriloquism. 64-page books. Complete guides, 10c. each. G. Fenner, 2401 Jefferson, Louisville, Ky.

Free with $25 order our large die box. Send 20c for our large catalogue of tricks, puzzles, wigs, sensational escapes. Oaks Magical Co., Dept. 519, Oshkosh, Wis.

Magic—Entertain with the best, hundreds of mystifying tricks you can do. Large catalog 10c. Sterling Magic Co., Box 33, Danville, Va.

Manuscripts—Short Stories Wanted

Earn $25 weekly, Spare time, writing for newspapers, magazines. Experience unnecessary. Details Free. Press Syndicate, 987, St. Louis, Mo.

Make $25 Weekly at home, spare time, writing short stories for photoplays. Experience unnecessary. Outline free. Producers League, 603, St. Louis, Mo.

Miscellaneous

Beautiful Registered Bull Pups, $15. Bulldogs, 501 Rockwood, Dallas, Texas.

Forms to cast Lead Soldiers, Indians, Marines, Trappers, Animals, 151 kinds. Send 10c for illustrated Catalogue. H. C. Schiercke, 1034-72nd St., Brooklyn, N. Y.

100 Genuine Indian Arrowheads from Arkansas. $4.00 postpaid. H. Daniel, Lamar, Ark.

Model Airplane Engines: ½ h. p. in 3 lbs.; 1 h. p. in 5 lbs. Stationary Engines: ½ h. p. in 10 lbs.; 1 h. p. in 15 lbs. Circulars free. DYNAMIC MFG. CO., First Nat'l Bank Bldg., Chicago.

Be Independent. Receive 100 letters a day containing 25c. and give a dollar article to every customer. Send 25c. for dollar article and complete plan. No fake. Dept. 2, Western Mailing Service, Box 906, Long Beach, Calif.

Cartoon Lesson, $1.00. Sparetime workers write Cuts. EXP, G.P.O. Box 471, New York.

Ford Armatures Rewound. $2.00, postpaid. Workmanship guaranteed. Quick service. Peter Jones, 27 Floyd Road, Jamaica, N. Y.

Hunting Hounds Cheap; trial. Dixie Kennels, C1, Herrick, Ill.

Underground Treasures. Simple, scientific method for locating explained free. T. Santschi, Glenellyn, Ill.

Models and Model Supplies

Ship Model Fittings: Steering wheels, Capstans, Anchors, Propellors. Send for booklet. A. J. Fisher, 1002 Etowah Ave., Royal Oak, Michigan.

Motion Pictures

Movieland's Newest Novelty. Shows famous movie stars on a screen in your own home. Complete outfit only $1. Particulars free. Agents wanted. M. Donlon, Box 99, Floral Park, N. Y.

Motorcycles—Bicycles

Motorcycle Bargains. Used, rebuilt. Guaranteed shipped on approval. Catalog free. Floyd Clymer, 812 Broadway, Denver, Colo.

Moulds

Moulds Making Toys. See ad on page 679. Miscellaneous. H. C. Schiercke.

Musical Instruments

Violins—Deep, Mellow, Soulful—on easy credit terms. High grade, wonderful instruments of my own make. Development of many years' experience. Write for book. Gustav A. Henning, 2424 Gaylord St., Denver, Colo.

Old Coins

California Gold, quarter size, 27c; half-dollar size, 53c. Columbian nickel and catalogue, 10c. Norman Shultz, Box 746, Salt Lake City, Utah.

Old Money Wanted

$2 to $500 Each paid for hundreds of Old or Odd Coins. Keep all old money, it may be very valuable. Send 10c for new illustrated Coin Value Book, 4x6. Guaranteed Prices. Get Posted, we pay Cash. Clarke Coin Company, 14 Street, LeRoy, N. Y.

Patent Attorneys

Millions spent annually for ideas! Hundreds now wanted! Patent yours and profit! Write today for free book—tells how to protect yourself, how to invent, ideas wanted, how we help you sell, etc. American Industries, Inc., 212 Victor Bldg., Washington, D. C.

Richard E. Babcock, Patent Lawyer, Washington Loan & Trust Bldg., Washington, D. C., Booklet.

Monroe E. Miller, Ouray Bldg., Washington, D. C. Patent Lawyer, Mechanical, Electrical Expert. Booklet and Priority Record blank gratis.

Patents—Send for form "Evidence of Conception" to be signed and witnessed. Form, free schedule information free. Lancaster and Allwine. Registered Patent Attorneys in United States and Canada, 242 Ouray Bldg., Washington, D. C.

Patents Procured; Trade Marks Registered—A comprehensive, experienced, prompt service for the protection and development of your ideas. Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request. Richard B. Owen, 130 Owen Bldg., Washington, D. C., or 41-T Park Row, New York.

Patents. Send for free booklet. Highest references. Best results. Promptness assured. Send model or drawing for examination and advice. Watson E. Coleman, Patent Attorney, 724-9th Street, N. W., Washington, D. C.

Patent Attorneys (Continued)

Unpatented Ideas Can Be Sold. I tell you how and help you make the sale. Free particulars. (Copyrighted). Write W. T. Greene, 809 Jenifer Bldg., Washington, D. C.

Patents. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free book, "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, Security Bank Building (directly across street from patent office), Washington, D. C. See page 637.

Patents: Trade-Marks. Ten years experience in Patent Office. Consultation invited. Booklet. Geo. Beeler, 9 Park Place, New York.

"Inventor's Advisor," Valuable Patentbook sent free. Labiner, 3 Park Row, New York.

Patent, Trade-Marks, Copyrights. Reliable services by an experienced practitioner devoting personal attention to each case. Inquiries invited. References furnished. B. F. Fishburne, Patent Lawyer, 525-D McGill Building, Washington, D. C.

Patents obtained under Co-operative Payment Plan. Write for particulars. W. E. Beck, Registered Patent Lawyer, 952 Jenifer Bldg., Washington, D. C.

Get your own patents. Forms, complete instruction $1 Cuttingbros, Campbell, Calif.

ADAM E. FISHER, Registered Patent Attorney, in business 25 years; references; personal attention and promptness assured; Dept. E, 205 Enright, St. Louis, Mo.

"Inventors' Guide" free on request; gives valuable information and advice for all who have original ideas or improvements. Frank Ledermann, Registered Attorney and Engineer, 17th Floor, Woolworth Bldg., New York.

Patents. Free advice, personal service of registered Attorney, former Patent Office Examiner. Booklet. Albert Jacobs, 728 Barrister Bldg., Washington.

Patents Secured. Easy terms. Inventors Service Bureau, Box 1648, Washington.

Inventors who derive largest profits know and heed certain simple but vital facts before applying for Patents. Our book Patent Sense gives those facts; free. Lacey & Lacey, 644 F St., Washington, D. C. Established 1869.

Patents

Inventions commercialized. Patented or unpatented. Write Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Patents Wanted

Inventions Commercialized. Patented or Unpatented. Write Adam Fisher Mfg. Co., 205 Enright, St. Louis, Mo.

Mr. Inventor—If you have a patent or invention for sale, write Hartley, 38 Court St., Bangor, Me.

Personal

Learn how to read character from the face. Send 10c. and 2c. stamp. Josef J. Brabender, Port Washington, Wis.

Photography

Have you a Camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

Transfer Photographs to metal, china, etc. Patented process. Makes beautiful miniatures. A real art. Lots of fun and profit. Anyone can do it. Outfit supplied to members only. Write about membership. Kyograph Photo System, 21-D W. 17th St., New York.

If you have a camera, I'll show you how to make money taking pictures. Particulars free. M. Donlon, Box 99, Floral Park, N. Y.

Photoplays Wanted

$$$ For Photoplay Plots, Stories accepted any form, revised, criticised, copyrighted, marketed. Estab. 1917. Booklet free. Universal Scenario Co., 223 Western & Santa Monico Bldg., Hollywood, Calif.

Pipe Smokers

Join Thousands smoking Scotch Clayschaum pipes. No nicotine bite or parch. Healthy, satisfying, economical. Six, $1.00; three, 50c; two, 35c, postpaid. Send postal for description. Clayschaum Pipe Company, Importers, 448 Park Road, Dept. K-3, Washington, D. C.

Pipe Smokers: We have specialized in pipe tobaccos for 22 years. Factory to smoker. Wonderful Blends and Flavors. Write for FREE Catalog and samples. The Planters Tobacco Co., Henderson, Ky.

Printing Outfits and Supplies

Print your own cards, stationery, circulars, paper, etc. Complete outfits $8.85; Job Presses $11, $29; Rotary $149. Print for others, big profit. All easy, rules sent. Write for catalog presses, type, paper, etc. Kelsey Company, F-6 Meriden, Conn.

200 Letterheads and 100 Envelopes, $1.00, postpaid. OBERMAN COMPANY, Box 1268, Chicago.

Radio

Boys! Don't overlook this. The "Rasco" Baby Detector. Greatest detector ever brought out with molded base. Fully adjustable. See former advertisements in this publication, or our catalogue. Detector with Galena Crystal complete 50c., the same detector with Radiocite Crystal 75c. prepaid. Send for yours today. Radio Specialty Company, 100 Park Place, New York City.

Complete Kit for Raytheon "BH" Eliminator $16.75. Write for lists and details. Radio Parts Sales Co., Orange, N. J.

Radio Equipment

Direct Factory Sale. Wholesale prices. Tremendous Savings. Selling direct to you. Here are some of our many items: 30 Henry Choke, 100 M.A. $2.19; 10 Henry Choke, 400 M.A. $5.48. Power Transformers for all kinds of Eliminators and for all types of A.C. Tubes at Special Low Prices. EVERY ITEM FULLY GUARANTEED. Promptly shipped upon receipt of order. Send for free illustrated catalog today. Todd Electric Co., Inc. (Manufacturers), 36 West 20th Street, Dept. B, New York City.

Salesmen Wanted

66 Miles on 1 Gallon—Amazing New Moisture Gas Saver. All autos, 1 Free. Critchlow, B-863, Wheaton, Ill.

Punchboard Salesmen. 2 hours daily. $100 every week. New line. Lowest prices. Full commission on repeat business. Catalog Free. Puritan Novelty Co., 1411-A Jackson, Chicago.

Song Poems

Song Poem Writers—Send for proposition. Ray Hibbeler, D24, 2104 N. Keystone Ave., Chicago.

Song Writers

Song Poem Writers, write Sequoia Songwriters Service, Sherman Branch, Los Angeles, California.

Song-poem writers. Address Monarch, 236 West 55th St., New York.

Stamps and Coins

Stamps 100 All Different 3 cents. S. I. Quaker Stamp Company, Toledo, O.

100 Different Stamps FREE to Approval Buyers. Postage 3c. Write NOW. Wineholt Stamp Co., Woodbine 27, Penna.

Telegraphy

Telegraphy—Both Morse and Wireless—taught thoroughly and quickly. Tremendous demand. Big salaries. Wonderful opportunities. Expenses low; chance to earn part. School established fifty years. Catalog free. Dodge's Institute, Stone St., Valparaiso, Ind.

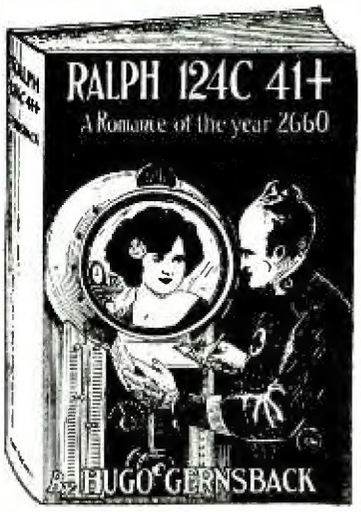
Typewriters

Typewriters, all standard makes, $10 up. Fully guaranteed. Free trial. Write for complete illustrated lists. Northwestern Exchange, 121 N. Francisco Ave., Chicago.

Wanted

Detectives Earn Big Money. Work home or travel. Experience unnecessary. Write, George Wagner, 2190 Broadway, N. Y.

AMAZING



WORLD SCIENCE and ROMANCE IN THE "YEAR 2660"

from the pen of the renowned editor and Scientific Experimenter HUGO GERNSBACK

Against an amazing background of machanical, electrical and chemically altered life of mankind there is set a brilliant and colorful romance in the life of the greatest living scientist of that age.

Ralph's love for the beautiful stranger, his conquest of his rival and the worsting of the great saturnine Martian, culminating in a running fight in space with tragedy and terror conquered by almost unbelievable and incredible weapons, make one of the most interesting and gripping stories ever told.

$2.15 POSTPAID

Experimenter Publishing Co.,
230 FIFTH AVENUE
NEW YORK, N. Y.

www.americanradiohistory.com

Twenty-four New Pictures of Motion Picture Stars

All For One Dollar

We have prepared a brand-new set of gravure-tint pictures of the most popular stars, size 5¼ x 7¾ inches, and offer them to our readers with a four months' subscription to MOTION PICTURE MAGAZINE for one dollar. Beautiful pictures for your den or album. Subjects:

Vilma Banky	Bebe Daniels	Norma Shearer
William Haines	Harold Lloyd	Marie Prevost
Greta Garbo	Dolores Del Rio	Tom Mix
Dolores Costello	Pola Negri	Colleen Moore
Rudolph Valentino	Betty Bronson	Corinne Griffith
John Gilbert	Clara Bow	Gloria Swanson
Fred Thomson	Reginald Denny	Richard Dix
Lew Cody	Olive Borden	Ramon Novarro

Pin a dollar bill to the coupon below and mail today. Subscribe for your friends and we will send them each a set of pictures.

Here is a fine gift for your family or friends. A set of these fine pictures is offered with each four months' subscription at this special dollar rate. Tell your friends about it —and send your subscription in today.

Send one dollar and this coupon now.

MOTION PICTURE PUBLICATIONS, INC.,
175 Duffield Street, Brooklyn, N. Y.

For the enclosed $1.00 please send me the set of twenty-four new pictures of motion picture stars and the next four issues of MOTION PICTURE MAGAZINE.

Name.....

Address.....

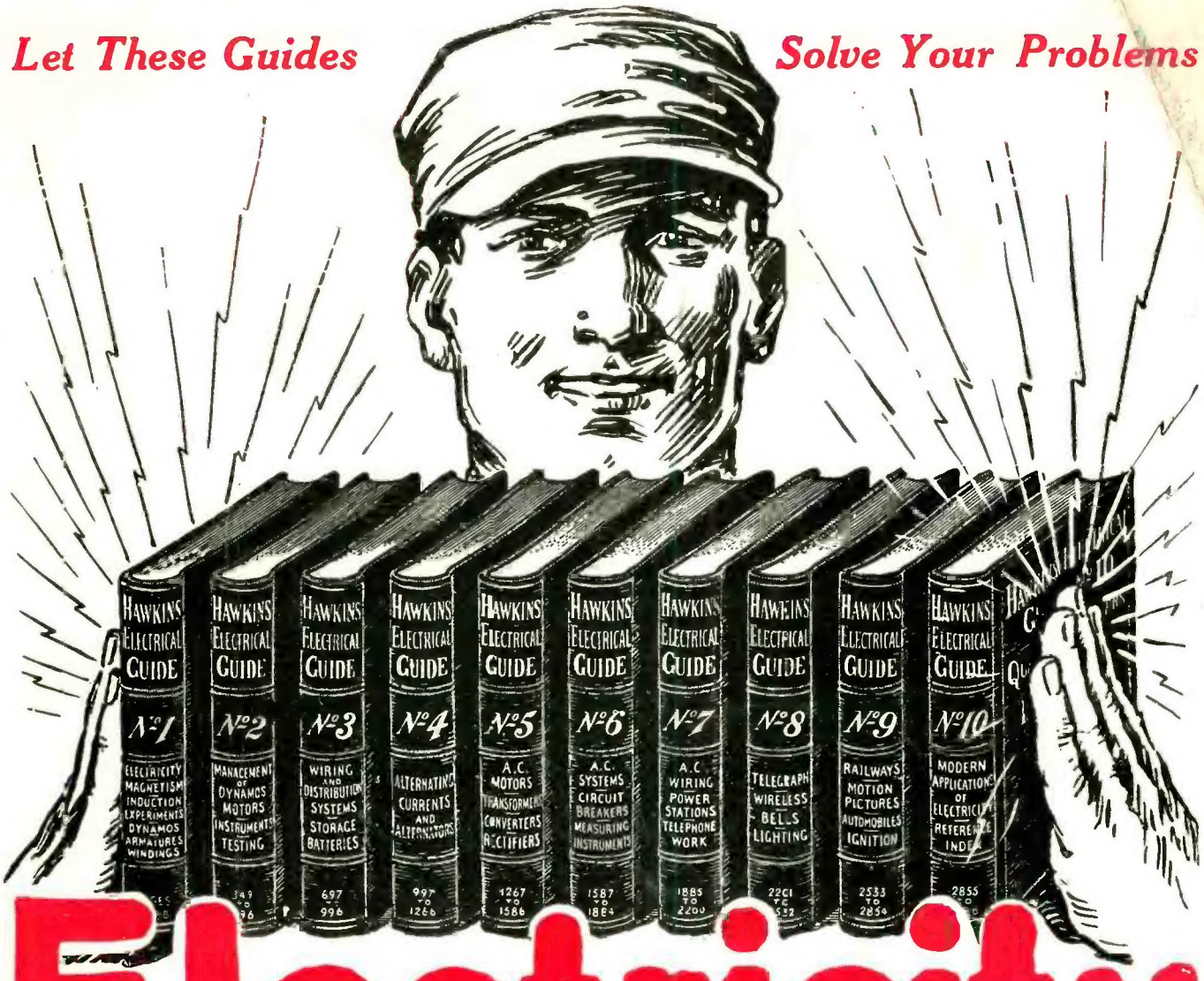
.....

Start with.....issue.

Canadian—Include ten cents extra for postage. Foreign—Thirty cents extra for postage.

www.americanradiohistory.com

Let These Guides *Solve Your Problems*



Electricity at your finger ends

HAWKINS ELECTRICAL GUIDES IN TEN VOLUMES

3500 PAGES
4700 PICTURES

$1 A VOLUME
$1 A MONTH

SEND NO MONEY—SEND ONLY THIS COUPON

Know the facts in Electricity. They mean more money and better position for you. Hawkins Guides tell you all you need to know about Electricity. Every important electrical subject covered so you can understand it. Easy to study and apply. A complete, practical working course, in 10 volumes. Books are pocket size; flexible covers. Order a set today to look over.

LEARN ALL ABOUT

Magnetism—Induction — Experiments — Dynamos — Electric Machinery—Motors—Armatures—Armature Windings—Installing of Dynamos—Electrical Instrument Testing—Practical Management of Dynamos and Motors—Distribution Systems—Wiring—Wiring Diagrams — Sign Flashers — Storage Batteries — Principles of Alternating Currents and Alternators — Alternating Current Motors — Transformers — Converters—Rectifiers—Alternating Current Systems—Circuit Breakers—Measuring Instruments—Switchboards—Wiring—Power Stations—Installing—Telephone—Telegraph—Wireless—Bells—Lighting—Railways. Also many Modern Practical Applications of Electricity and Ready Reference Index of the ten numbers.

SHIPPED FREE

Not a cent to pay until you see the books. No obligation to buy unless you are satisfied. Send Coupon now—today—and get this great help library and see if it is not worth $100 to you—you pay $1.00 a month for ten months or return it.

THEO. AUDEL & CO.
65 West 23rd Street, New York City.

Please submit me for free examination, HAWKINS ELECTRICAL GUIDE (Price $1 a number). Ship at once prepaid, the 10 numbers. If satisfactory, I agree to send you $1 within seven days and to further mail you $1 each month until paid.

Name .....

Occupation .....

Employed by .....

Home Address .....

Reference .....

S. I., Nov.

www.americanradiohistory.com

7 Tube Set
Single Dial Radio

30 DAYS FREE TRIAL

Metrodyne Radio Sets
Are Equipped For
BATTERY or ELECTRIC operation

The Metrodyne
ONLY ONE DIAL TO TUNE

RETAIL PRICE
$75.00
Completely Assembled
Big Discounts to Agents and Dealers

Wonderful offer direct from the factory! The world's greatest radio! A perfect working, single dial control, 7 tube receiver! And just to prove our claims, we will ship it to your home for **30 days' free trial.** Test it under all conditions. Test it for distance, volume and tonal quality—and if you are not convinced that it is the best single dial set you ever heard, return it to the factory. We don't want your money unless you are completely satisfied.

Three Year Guarantee

BIG PROFITS TO AGENTS AND DEALERS

Our Agents and Dealers make big money selling Metrodyne Sets. You can work all or part time. Demonstrate the superiority of Metrodynes right in your home. Metrodyne Radios have no competition. Lowest wholesale prices. Demonstrating set on 30 days' free trial. Greatest money-making opportunity. Send coupon, a letter or a postal for our agent's proposition.

Metrodyne Super-Seven Radio

A single dial control, 7 tube, tuned radio frequency set. **Tested and approved by Popular Science Institute of Standards, Popular Radio Laboratory, Radio News Laboratory** and by **America's leading Radio Engineers.** Designed and built by radio experts. Only the highest quality low loss parts are used. Magnificent, two-tone walnut cabinet with beautiful, gilt metal trimmings. Very newest 1928 model, embodying all the latest refinements.

Easiest set to operate. Only one small knob tunes in all stations. The dial is electrically lighted so that you can log stations in the dark. The volume control regulates the reception from a faint whisper to thunderous volume, **1,000 to 3,000 miles on loud speaker!** The Metrodyne Super-Seven is a beautiful and efficient receiver, and we are so sure that you will be delighted with it, that we make this liberal **30 days' free trial offer.** You to be the judge.

6 Tube Set
$48.50
RETAIL PRICE
Completely Assembled

30 Days' Free Trial—3 Year Guarantee

Metrodyne Super-Six

Another triumph in radio. Here's the new 1928 model Metrodyne 6 tube, two dial, long distance tuned radio frequency receiving set. Approved by leading radio engineers of America. Highest grade low loss parts, completely assembled in a beautiful walnut cabinet. Easy to operate. Dials easily logged. Tune in your favorite station on same dial readings every time — no guessing.

Mr. Howard, of Chicago, said: "While five Chicago broadcasting stations were on the air I tuned in seventeen out-of-town stations, including New York and San Francisco, on my loud speaker horn, very loud and clear, as though they were all in Chicago."

We are one of the pioneers of radio. The success of Metrodyne sets is due to our liberal 30 days' free trial offer, which gives you the opportunity of trying before buying. Thousands of Metrodynes have been bought on our liberal free trial basis.

MAIL THIS COUPON
or send a postal or letter. Get our proposition before buying a radio. Deal direct with manufacturer—
SAVE MONEY—WRITE NOW!

MAIL COUPON BELOW

Let us send you proof of Metrodyne quality—our 30 days' free trial offer and 3 year guarantee

Mrs. Wm. Leffingwell, Westfield, N. J., writes: "The Metrodyne Radio I bought of you is a wow! This is as good as any $225 machine I have ever seen."

N. M. Greene, Maywood, Ill., writes: "My time is up and the Metrodyne works fine. I got Havana, Cuba, Oakland, Calif., Denver, Colo., Toronto, Canada, all on the loud speaker."

J. W. Woods, Leadville, Colo., writes: "Received the 7-tube Metrodyne in fine condition. Had it up and working same day received. Was soon listening to Los Angeles, San Diego, Oakland and other California points; also St. Louis, Kansas City and other east and south stations—all coming in fine. Am more than pleased. Sure enjoying it."

We will send you hundreds of similar letters from owners who acclaim the Metrodyne as the greatest radio set in the world. A postal, letter or the coupon brings complete information, testimonials, wholesale prices, and our liberal **30 days' free trial offer.**

METRO ELECTRIC COMPANY
2161-71 N. California Ave., Dept. 23
Chicago, Illinois

Gentlemen:

Send me full particulars about Metrodyne 6 tube and 7 tube sets and your **30 days' free trial offer.**

*Name*_____

*Address*_____

If you are interested in AGENT'S proposition, place an "X" in the square ☐

METRO ELECTRIC COMPANY
2161-71 N. California Ave. • Dept. 28 • Chicago, Illinois

www.americanradiohistory.com